# FCC RADIO TEST REPORT

**For**

**FCC ID: 2AAA9-RA340**

| | |
|---|---|
| Report Reference No. ..... : | 19EFAS05085 21 |
| Date of issue ..... : | 2019-05-24 |
| Testing Laboratory ..... : | DongGuan ShuoXin Electronic Technology Co., Ltd. |
| Address ..... : | Zone A, 1F, No. 6, XinGang Road YuanGang Street, XinAn District, ChangAn Town, DongGuan City, GuangDong, China |
| Applicant's name……..: | Relay2, Inc. |
| Address……..: | Suite 209, 1525 McCarthy Blvd., Milpitas, CA 95035 |
| Manufacturer……..: | Senao Networks, Inc. |

**Test specification:**

| | |
|---|---|
| Test item description ..... : | Service-Ready Access Point |
| Trade Mark ..... : | Relay2 |
| Model/Type reference ..... : | RA345, RA340 |
| Ratings ..... : | DC12V 3.0A |

Responsible Engineer : Lake Hu

Authorized Signatory: Maoxing Wang

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TEST REPORT DECLARE

| | | |
|---|---|---|
| **Applicant** | : | Relay2, Inc. |
| **Address** | : | Suite 209, 1525 McCarthy Blvd., Milpitas, CA 95035 |
| **Equipment under Test** | : | Service-Ready Access Point |
| **Model No** | : | RA345 |
| **Trade Mark** | : | Relay2 |
| **Manufacturer** | : | Senao Networks, Inc. |
| **Address** | : | No. 500, Fusing 3rd Rd., Hwa-Ya Technology Park, Kuei-Shan Dist., Taoyuan City 33383, Taiwan |

**Test Standard Used:** FCC Rules and Regulations Part 15 Subpart C (15.247)

**Test procedure used:** ANSI C63.10:2013, 558074 V05.

**We Declare:**

The equipment described above is tested by DongGuan ShuoXin Electronic Technology Co., Ltd. and in the configuration tested the equipment complied with the standards specified above. The test results are contained in this test report and DongGuan ShuoXin Electronic Technology Co., Ltd. is assumed of full responsibility for the accuracy and completeness of these

tests.

**After test and evaluation, our opinion is that the equipment provided for test compliance with the requirement of the above FCC standards.**

| | | | |
|---|---|---|---|
| **Report No:** | 19EFAS05085 21 | | |
| **Date of Test:** | 2019-04-28 | **Date of Report**: | 2019-05-24 |

Note: This report applies to above tested sample only. This report shall not be reproduced in parts without written approval of DongGuan ShuoXin Electronic Technology Co., Ltd.

# 1. Summary of test Standards and results

The EUT have been tested according to the applicable standards as referenced below.

| Description of Test Item | Standard | Results |
|---|---|---|
| 6dB Bandwidth And 99% Occupied Bandwidth | FCC Part 15.247 (a)(2) | PASS |
| Peak Output Power | FCC Part 15.247(b)(3) | PASS |
| Power Spectral Density | FCC Part 15.247(e) | PASS |
| Spurious Emissions at Antenna Port | FCC Part 15.247(d) | PASS |
| Spurious Emissions | FCC Part 15.205, 15.209, FCC Part 15.247(d) | PASS |
| 100 kHz Bandwidth of Frequency Band Edge | FCC Part 15.247(d) | PASS |
| AC Line Conducted Emissions | FCC Part 15.207 (a) | PASS |
| Antenna requirement | FCC Part 15: 15.203 | PASS |

# 2. GENERAL TEST INFORMATION

## 2.1. Description of EUT

| | | |
|---|---|---|
| EUT* Name | : | Service-Ready Access Point |
| Model Number | : | RA345 |
| Trade Mark | : | Relay2 |
| EUT function description | : | Service-Ready Access Point with WiFi function. |
| Power supply | : | DC12V 3.0A |
| Adaptor | | N/A |
| Radio Specification | : | IEEE802.11b/g/n20/n40 |
| Operation frequency | : | IEEE 802.11b: 2412MHz—2462MHz<br>IEEE 802.11g: 2412MHz—2462MHz<br>IEEE 802.11n20: HT20: 2412MHz—2462MHz<br>IEEE 802.11n40: HT40: 2422MHz—2452MHz |
| Modulation | : | IEEE 802.11b: DSSS(CCK,DQPSK,DBPSK)<br>IEEE 802.11g: OFDM(64QAM, 16QAM, QPSK, BPSK)<br>IEEE 802.11n20: HT20: OFDM (64QAM, 16QAM, QPSK,BPSK)<br>IEEE 802.11n40: HT40: OFDM (64QAM, 16QAM, QPSK,BPSK) |
| Antenna Type | : | PFIA Antenna |
| Antenna Gina | | Please see 2.7. |
| FVIN | | NA |
| Date of Receipt | : | 2019/05/24 |
| Sample Type | : | N/A |

Note: EUT is the ab. of equipment under test.

## 2.2. Accessories of EUT

| Description of Accessories | Manufacturer | Model number or Type | Other |
|---|---|---|---|
| / | / | / | / |

## 2.3. Assistant equipment used for test

| Description of Assistant equipment | Manufacturer | Model number or Type | EMC Compliance | SN |
|---|---|---|---|---|
| Adapter | / | Y48DE-120-3500 | FCC/CE | / |

d

## 2.4. Block diagram of EUT configuration for test


EUT was connected to control to a special test jig provided by manufacturer , and the Notebook will run a special test software “DRTU ” provided by manufacturer to control EUT work in test mode as blow table.

| Tested mode, channel, and data rate information | | | |
|---|---|---|---|
| Mode | data rate (Mpbs) (see Note) | Channel | Frequency (MHz) |
| IEEE 802.11b | 1 | Low :CH1 | 2412 |
| | 1 | Middle: CH6 | 2437 |
| | 1 | High: CH11 | 2462 |
| IEEE 802.11g | 6 | Low :CH1 | 2412 |
| | 6 | Middle: CH6 | 2437 |
| | 6 | High: CH11 | 2462 |
| IEEE 802.11n HT20 | MCS 0 | Low :CH1 | 2412 |
| | MCS 0 | Middle: CH6 | 2437 |
| | MCS 0 | High: CH11 | 2462 |
| IEEE 802.11n HT40 | MCS 0 | Low :CH3 | 2422 |
| | MCS 0 | Middle: CH6 | 2437 |
| | MCS 0 | High: CH9 | 2452 |
| Note: 1.According exploratory test, EUT will have maximum output power in those data rate, so those data rate were used for all test.<br>2. The EUT was used fully-charged battery and programmed to be in continuously transmitting mode and the transmit duty cycle is not less than 98%.<br>3. The EUT does not support MIMO mode. | | | |

## 2.5. Test environment conditions

During the measurement the environmental conditions were within the listed ranges:

| | |
|---|---|
| Temperature range: | 21-25℃ |
| Humidity range: | 40-75% |
| Pressure range: | 86-106kPa |

## 2.6. Measurement uncertainty

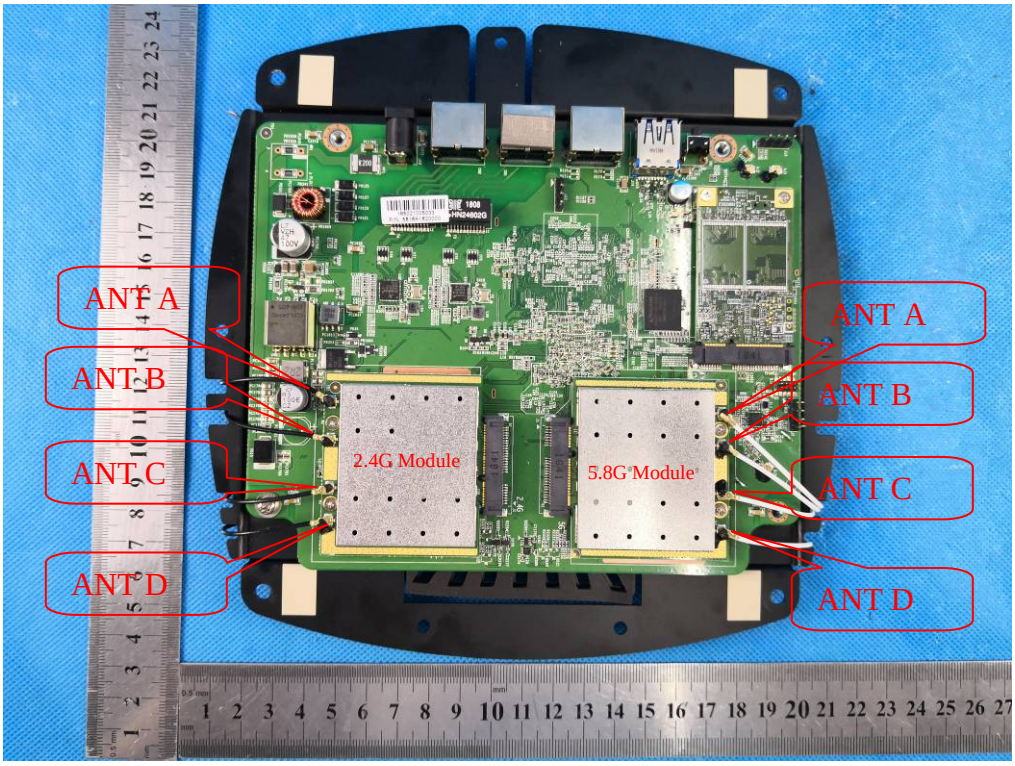
| Test Item | Uncertainty |
|---|---|
| Uncertainty for Conduction emission test (9kHz-150kHz) | 3.7 dB |
| Uncertainty for Conduction emission test (150kHz-30MHz) | 3.3 dB |
| Uncertainty for Radiation Emission test (30MHz-200MHz) | 4.60 dB (Polarize: V) |
| | 4.60 dB (Polarize: H) |
| Uncertainty for Radiation Emission test (200MHz-1GHz) | 6.10 dB (Polarize: V) |
| | 5.08 dB (Polarize: H) |
| Uncertainty for Radiation Emission test (1GHz-6GHz) | 5.01 dB (Polarize: V) |
| | 5.01 dB (Polarize: H) |
| Uncertainty for Radiation Emission test (6GHz-18GHz) | 5.26 dB (Polarize: V) |
| | 5.26 dB (Polarize: H) |
| Uncertainty for Radiation Emission test (18GHz-40GHz) | 5.06 dB (Polarize: V) |
| | 5.06 dB (Polarize: H) |
| Uncertainty for radio frequency | ±0.048kHz |
| Uncertainty for conducted RF Power | ±0.32dB |

Note：This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

## 2.7 Antenna description

| Antenna | Brand | Model Name | Antenna Type | Gain (dBi) | NOTE |
|---|---|---|---|---|---|
| A/B/C/D | N/A | N/A | PIFA antenna | 2.4G:3.74 | Wifi Antenna |
| A/B/C/D | N/A | N/A | PIFA antenna | 5G:5.7 | Wifi Antenna |

The Control software(tool_WIFI.exe) can control antenna A B,C,D ,
For 2.4GHz mode, antenna A /B are transmitting, antenna C / D are Receiving.
For 5 GHz mode, antenna A /B are transmitting, antenna C / D are Receiving.



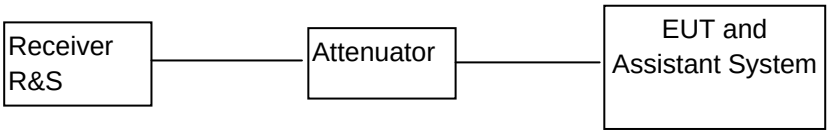

For MIMO mode: Directional gain=GANT +10log(N)dBi =6.75dbi in 2.4GHz
Directional gain=GANT +10log(N)dbi =8.71dbi in 5GHz
802.11a/b/g/n/ac 2.4GHz & 5GHz has MIMO mode.

# 3. 6dB Bandwidth and 99% Occupied Bandwidth

## 3.1. Test equipment

| Item | Equipment | Manufacturer | Model No. | Serial No. | Calibrated until | Calibrated Date |
|---|---|---|---|---|---|---|
| 1 | Spectrum analyzer | KEYSIGHT | N9010A | MY55150427 | 05/25/2019 | 05/26/2018 |
| 2 | Attenuator | Mini-Circuits | BW-S10W2 | 101109 | 12/17/2019 | 12/18/2018 |
| 3 | RF Cable | Micable | C10-01-01-1 | 100309 | 12/17/2019 | 12/18/2018 |

## 3.2. Block diagram of test setup




## 3.3. Limits

For direct sequence systems, the minimum 6dB bandwidth shall be at least 500 KHz

## 3.4. Test Procedure

(1) Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.

(2) Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.

(3) Measure the frequency difference of two frequencies that were attenuated 6 dB from the reference level. Record the frequency difference as the emission bandwidth.

(4) Repeat above procedures until all frequencies measured were complete.

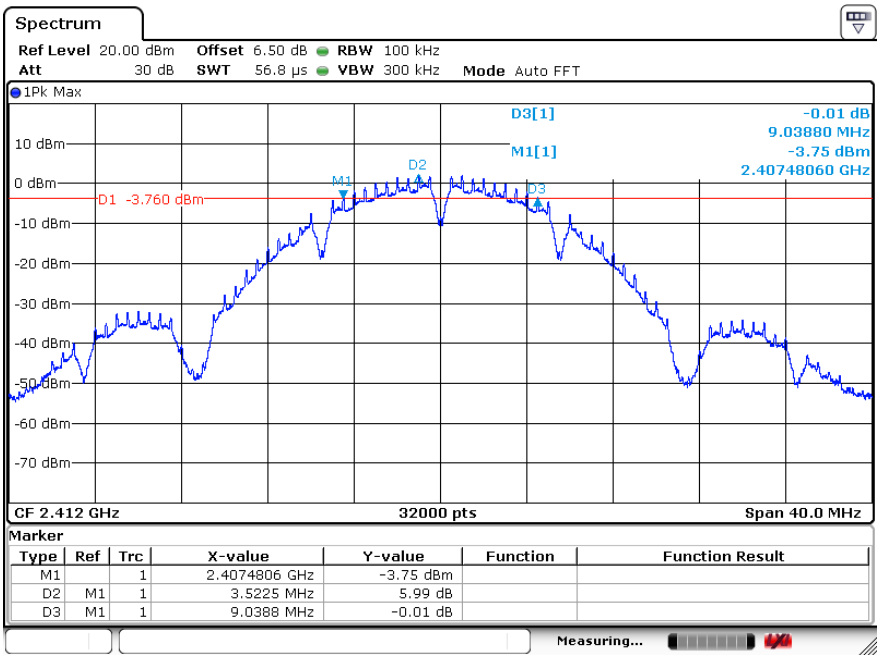
## 3. Test Result

| EUT Set Mode | CH or Frequency | 6dB bandwidth (MHz) | | Limt | Conclusion |
|---|---|---|---|---|---|
| | | ANT A | ANT B | >500KHz | PASS |
| IEEE 802.11B | CH 1 | 9.0388 | 9.0064 | >500KHz | PASS |
| | CH 6 | 9.0363 | 9.0641 | | PASS |
| | CH 11 | 9.0300 | 8.9466 | | PASS |
| IEEE 802.11G | CH 1 | 16.3325 | 16.0265 | | PASS |
| | CH 6 | 16.3488 | 17.1006 | | PASS |
| | CH 11 | 16.3300 | 16.3146 | | PASS |
| IEEE 802.11N20 | CH 1 | 17.4363 | 17.3193 | | PASS |
| | CH 6 | 17.5688 | 17.4308 | | PASS |
| | CH 11 | 17.8888 | 17.7333 | | PASS |
| IEEE 802.11N40 | CH 1 | 36.3450 | 36.3167 | | PASS |
| | CH 6 | 35.7100 | 35.5321 | | PASS |
| | CH 11 | 36.4300 | 36.3319 | | PASS |

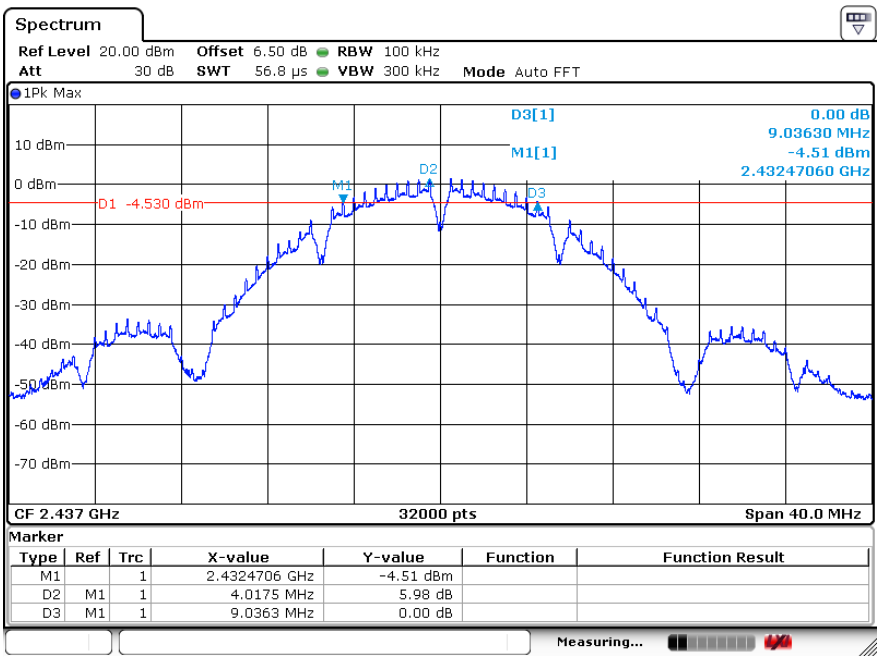
Note: A(B) Represent the value of antenna A and B,The worst data is A Antenna a ,only shown Antenna A Plot.

## 3.6. Original test data

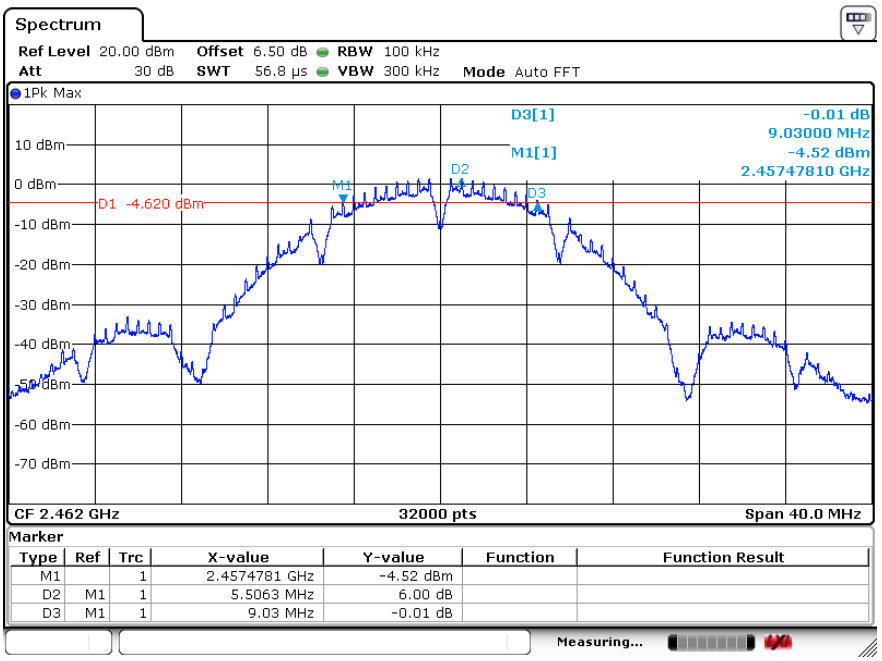
802.11 B Mode CH1



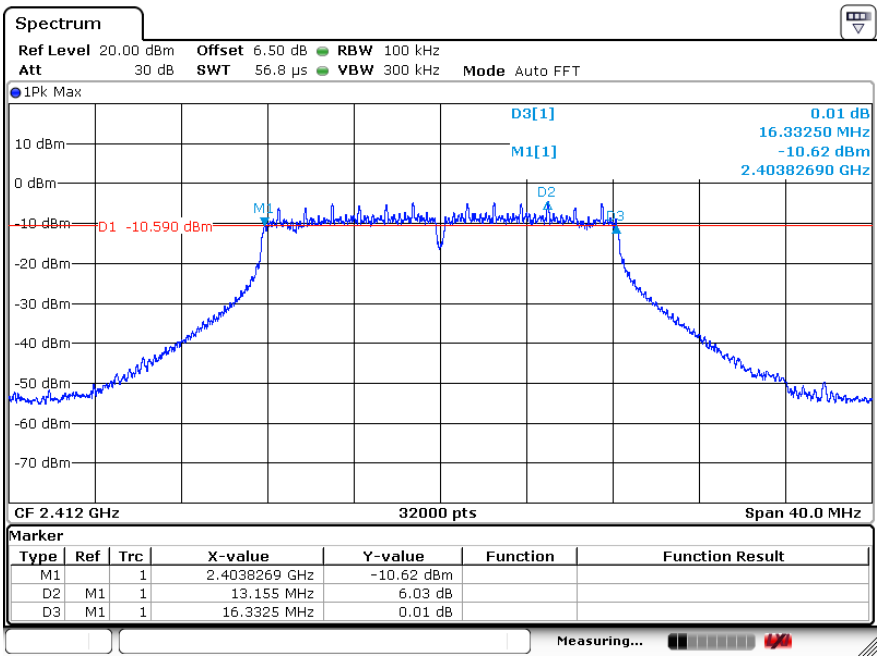

802.11 B Mode CH6



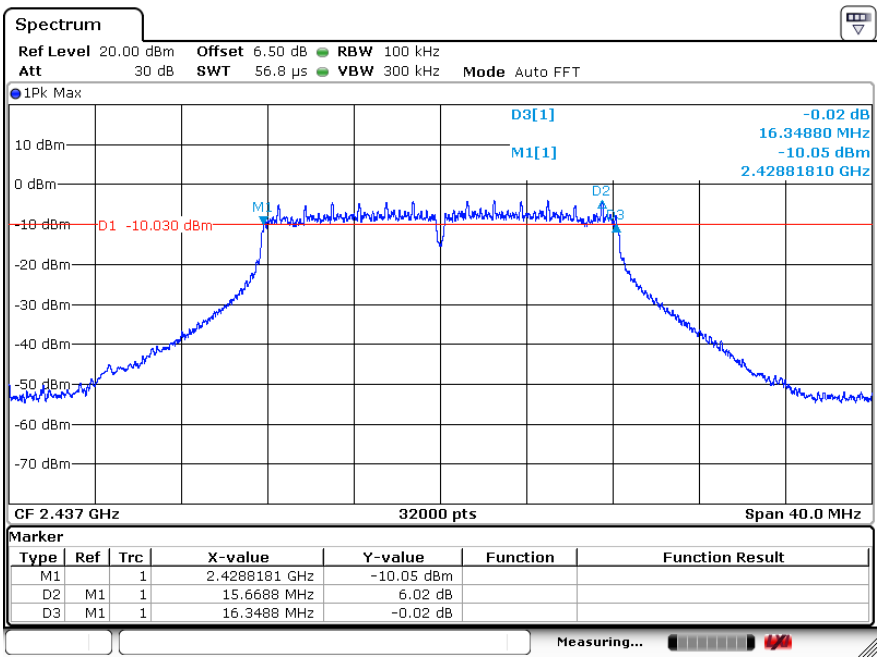
802.11 B Mode CH11



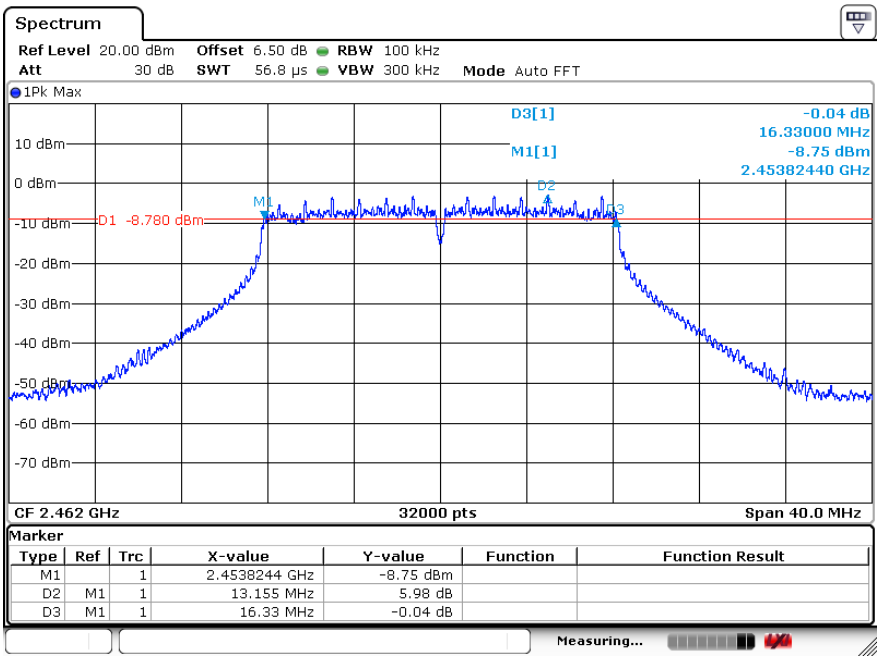

802.11 G Mode CH1



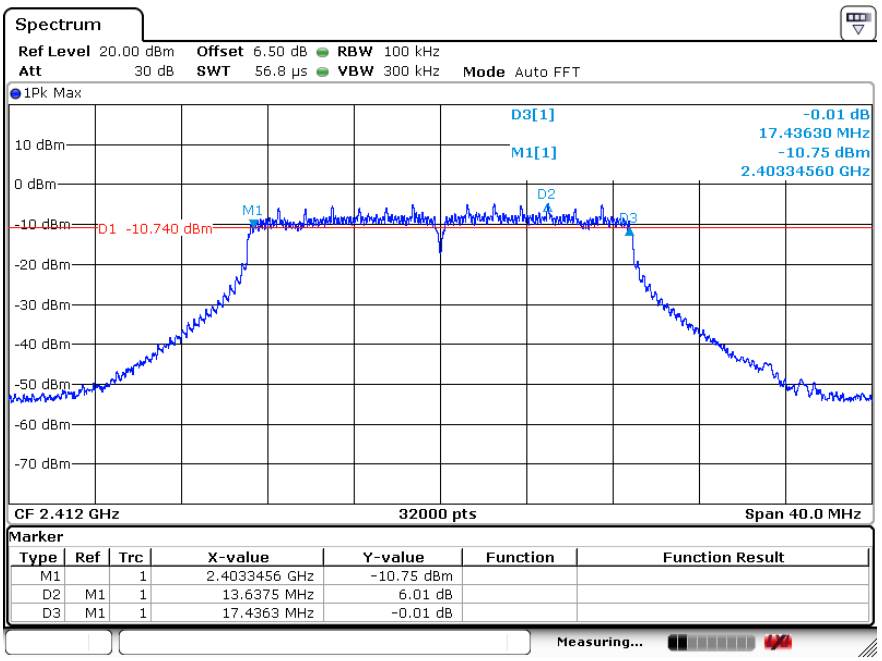
802.11 G Mode CH6



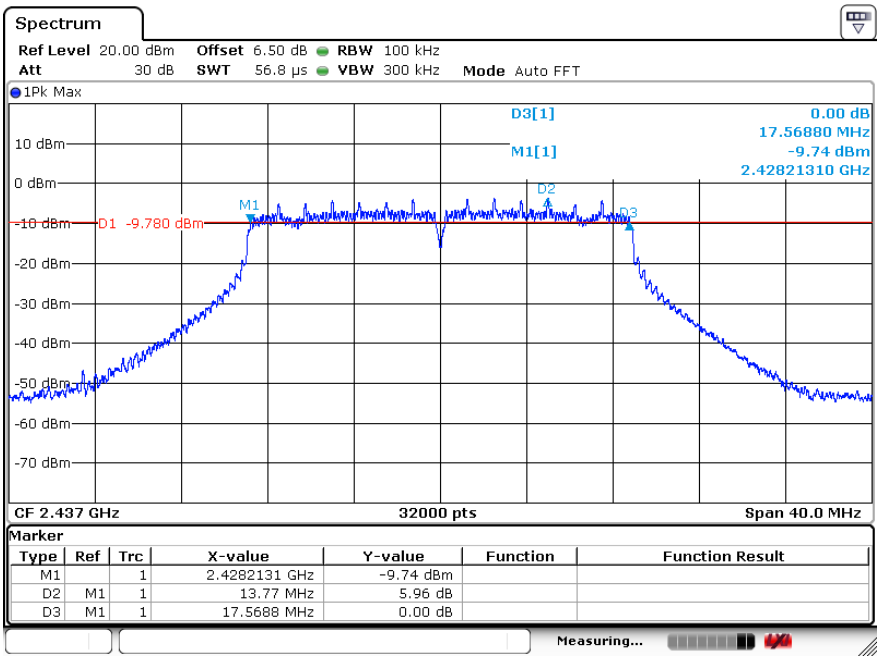

802.11 G Mode CH11



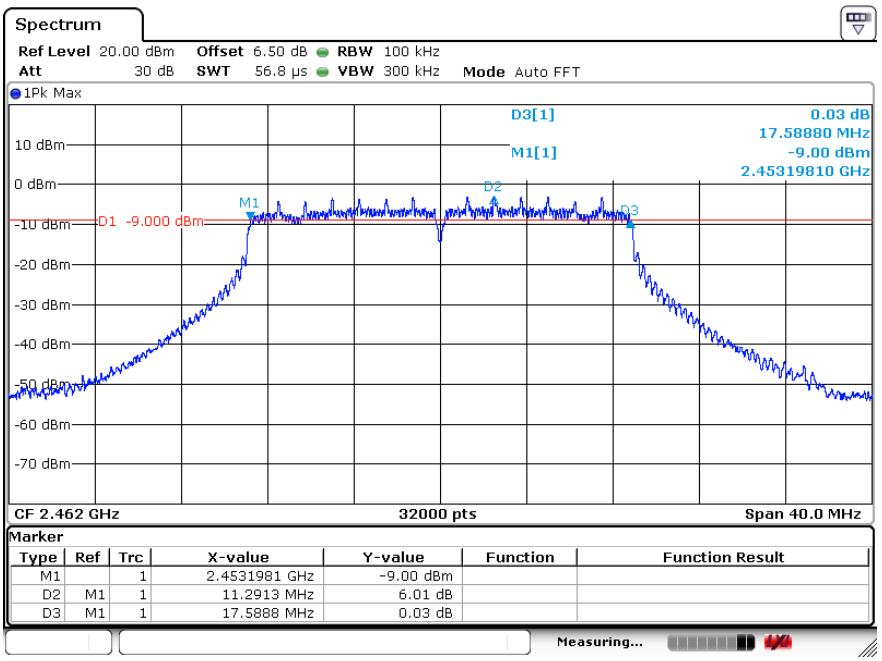
802.11 N20 Mode CH1



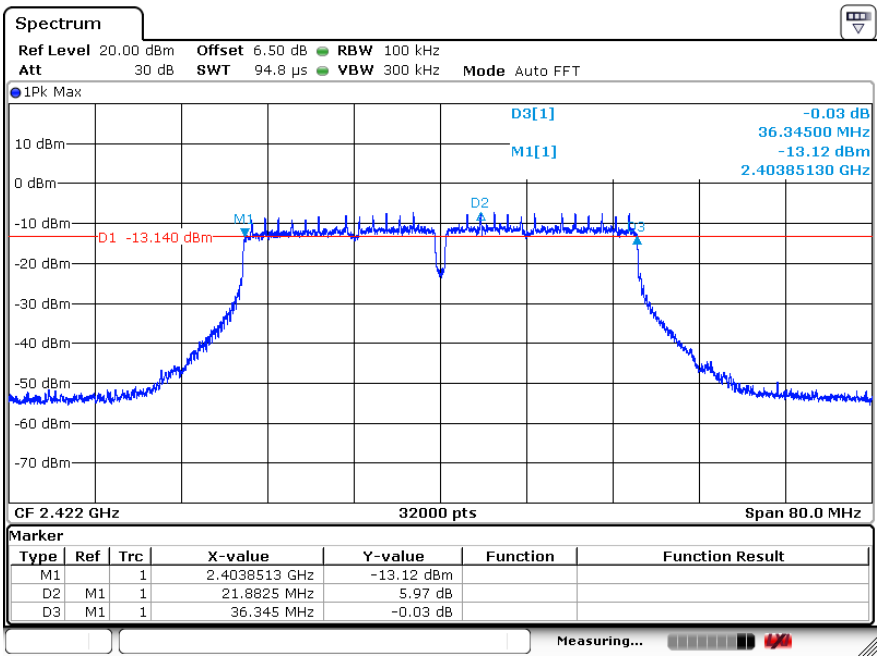

802.11 N20 Mode CH6



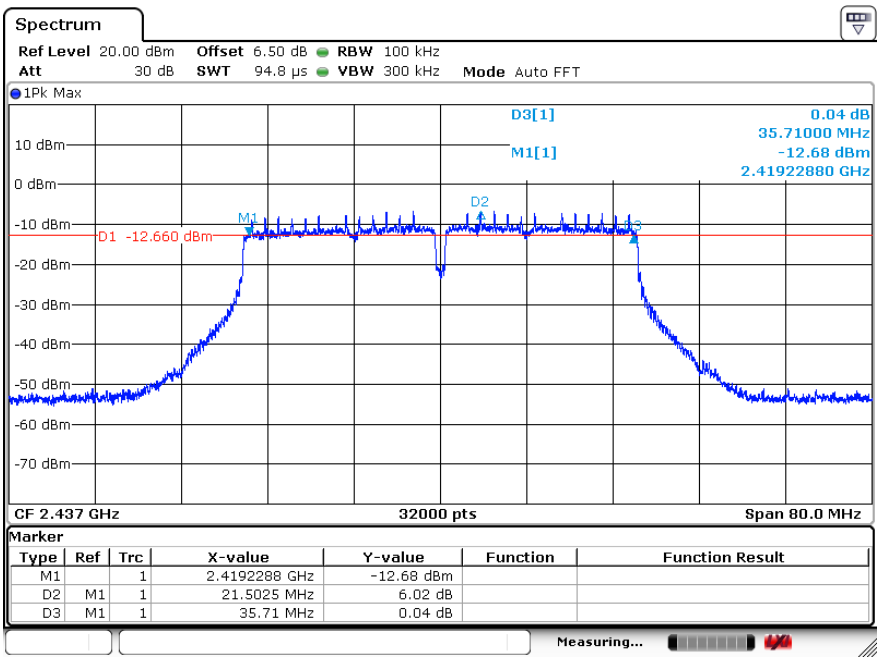
802.11 N20 Mode CH11



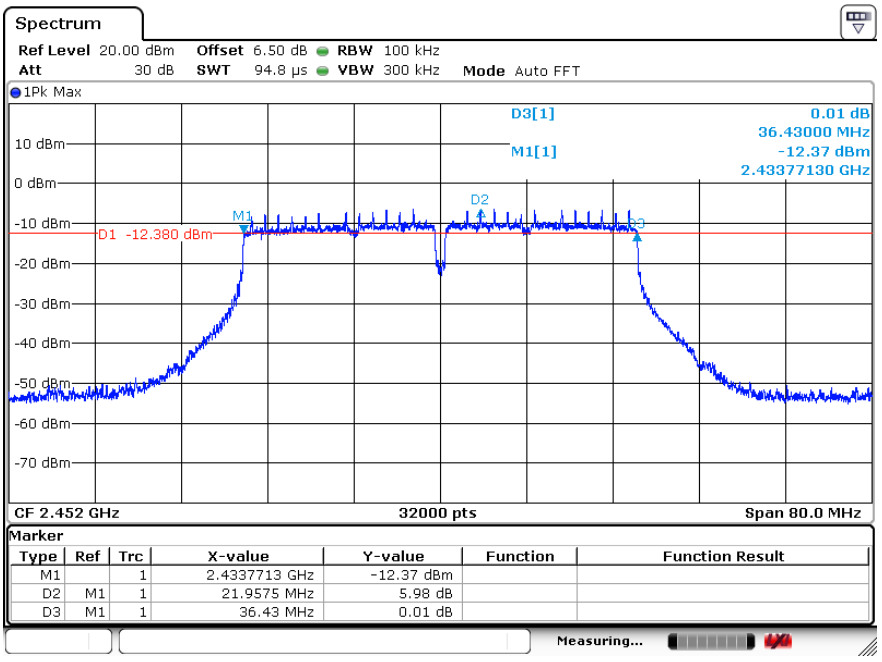

802.11 N40 Mode CH3



802.11 N40 Mode CH6




802.11 N40 Mode CH9

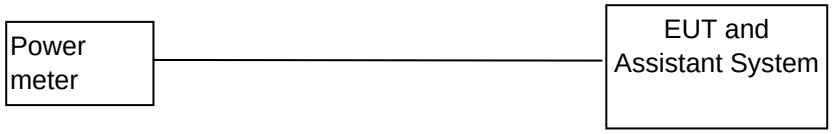


# 4. Maximum Peak Output Power

## 4.1. Test equipment

| Item | Equipment | Manufacturer | Model No. | Serial No. | Calibrated until | Calibrated Date |
|---|---|---|---|---|---|---|
| 1 | Power meter | Agilent | E4417A | MY45100473 | 05/26/2019 | 05/27/2018 |
| 2 | Wireband Power sensor | Agilent | E4427A | MY5100041 | 12/17/2019 | 12/18/2018 |
| 3 | RF Cable | Micable | C10-01-01-1 | 100309 | 12/17/2019 | 12/18/2018 |

## 4.2. Block diagram of test setup




## 4.3. Limits

For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz bands: 1 Watt. If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

## 4.4. Test Procedure

1. Place the EUT on a bench and set it in transmitting mode. .
2. A wide band power meter with a matched thermocouple detector was used to directly measure the output power from the RF output port of the EUT in continuously transmitting mode.
3. The measurement shall be repeated at the lowest, the middle, and the highest channel of the stated frequency range.

## 4.5. TEST RESULT

| Test Channe | Frequency | otal Power | | Total Power | LIMIT |
|---|---|---|---|---|---|
| | | (PK) (dBm) | | (PK) | |
| | (MHz) | ANT A | ANT B | dBm | dBm |
| TX 802.11b Mode | | | | | |
| CH01 | 2412 | 13.23 | 13.03 | 16.14 | 29.25 |
| CH06 | 2437 | 12.63 | 12.35 | 15.50 | 29.25 |
| CH11 | 2462 | 12.78 | 12.43 | 15.62 | 29.25 |
| TX 802.11g Mode | | | | | |
| CH01 | 2412 | 13.55 | 13.38 | 16.48 | 29.25 |
| CH06 | 2437 | 13.33 | 13.27 | 16.31 | 29.25 |
| CH11 | 2462 | 14.74 | 14.39 | 17.58 | 29.25 |
| TX 802.11n/20M Mode | | | | | |
| CH01 | 2412 | 12.64 | 13.43 | 16.06 | 29.25 |
| CH06 | 2437 | 13.31 | 13.13 | 16.23 | 29.25 |
| CH11 | 2462 | 14.11 | 14.43 | 17.28 | 29.25 |
| TX 802.11n/40M Mode | | | | | |
| CH03 | 2422 | 13.76 | 14.10 | 16.94 | 29.25 |
| CH06 | 2437 | 14.34 | 14.25 | 17.31 | 29.25 |
| CH09 | 2452 | 14.74 | 14.43 | 17.60 | 29.25 |

For 2.4G mode, Limit =30-6.75+6=29.25dBm for output power.

# 5. Power Spectral Density

## 5.1. Test equipment

| Item | Equipment | Manufacturer | Model No. | Serial No. | Calibrated until | Calibrated Date |
|---|---|---|---|---|---|---|
| 1 | Spectrum analyzer | KEYSIGHT | N9010A | MY55150427 | 05/26/2019 | 05/27/2018 |
| 2 | Attenuator | Mini-Circuits | BW-S10W2 | 101109 | 12/17/2019 | 12/18/2018 |
| 3 | RF Cable | Micable | C10-01-01-1 | 100309 | 12/17/2019 | 12/18/2018 |
| 4 | Spectrum analyzer | R&S | FSV40 | 101470 | 06/26/2019 | 06/27/2018 |

## 5.2. Block diagram of test setup


## 5.3. Limits

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission.

## 5.4. TEST PROCEDURE

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generatorl.
2. Position the EUT was set without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range
3. According to KDB 558074 D01 DTS Meas Guidance v03, set the RBW = 3 kHz, VBW = 30 kHz, Set the span to 1.5 times the DTS channel bandwidth.
4. Use the peak marker function to determine the maximum power level in any 3 kHz band segment within the fundamental EBW

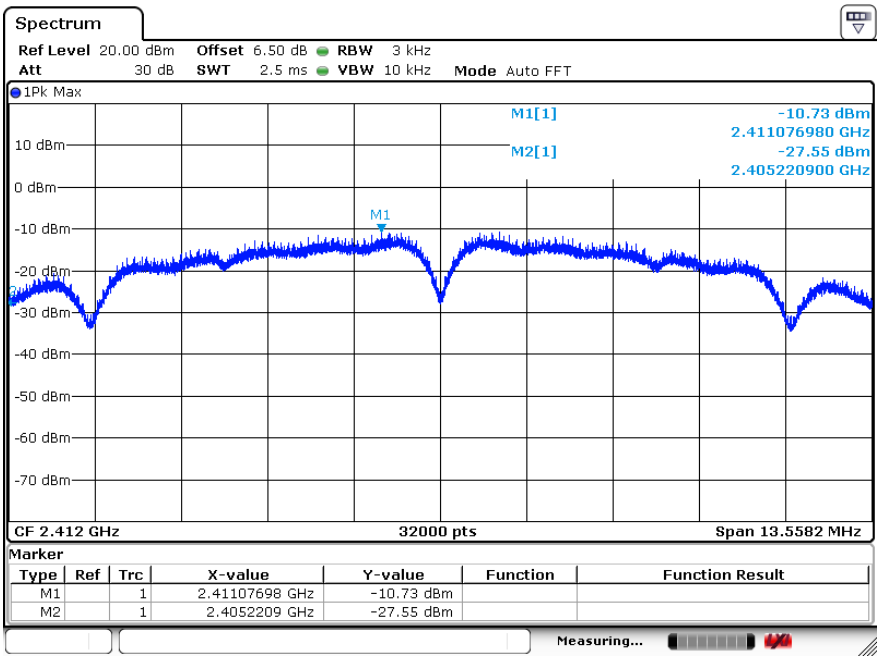
## 5.5. Test Result

| Frequency | Power Density ANT A (dBm) | Power Density ANT B (dBm) | Total power density (dBm) | Limit (dBm) | Result |
|---|---|---|---|---|---|
| IEEE 802.11B | | | | | |
| 2412 MHz | -10.73 | -10.76 | -7.73 | 7.25 | PASS |
| 2437 MHz | -12.48 | -12.76 | -9.61 | 7.25 | PASS |
| 2462 MHz | -12.17 | -12.54 | -9.34 | 7.25 | PASS |
| IEEE 802.11G | | | | | |
| 2412 MHz | -17.69 | -17.98 | -14.82 | 7.25 | PASS |
| 2437 MHz | -16.81 | -16.78 | -13.78 | 7.25 | PASS |
| 2462 MHz | -15.92 | -15.99 | -12.94 | 7.25 | PASS |
| IEEE 802.11N20 | | | | | |
| 2412 MHz | -18.37 | -18.97 | -15.65 | 7.25 | PASS |
| 2437 MHz | -17.34 | -17.96 | -14.63 | 7.25 | PASS |
| 2462 MHz | -17.52 | -17.87 | -14.68 | 7.25 | PASS |
| IEEE 802.11N40 | | | | | |
| 2422 MHz | -20.69 | -20.98 | -17.82 | 7.25 | PASS |
| 2437 MHz | -20.67 | -20.86 | -17.75 | 7.25 | PASS |
| 2452 MHz | -18.94 | -19.13 | -16.02 | 7.25 | PASS |

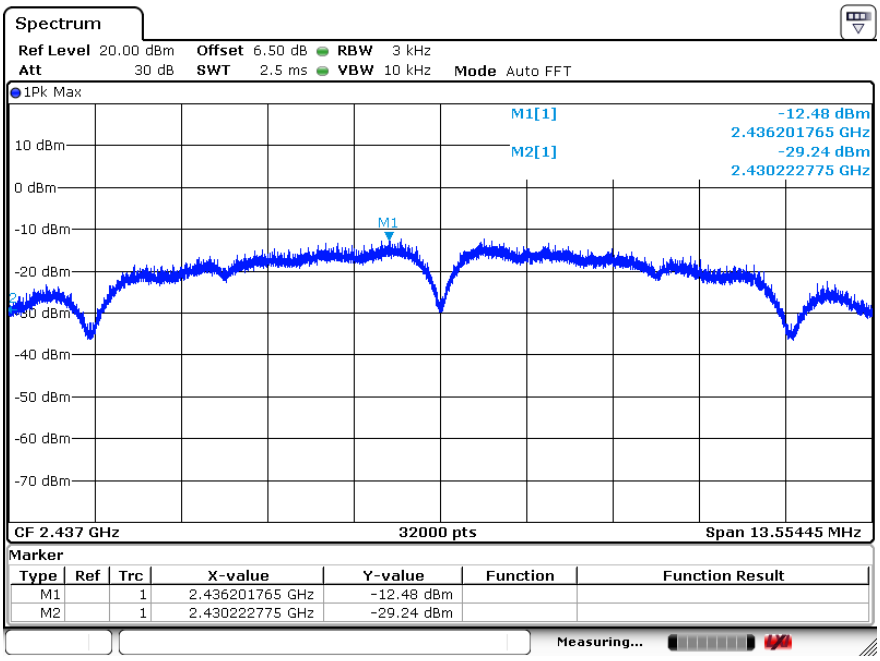
For 2.4G mode, Limit =8-6.75+6=7.25.

## 5.6. Original test data

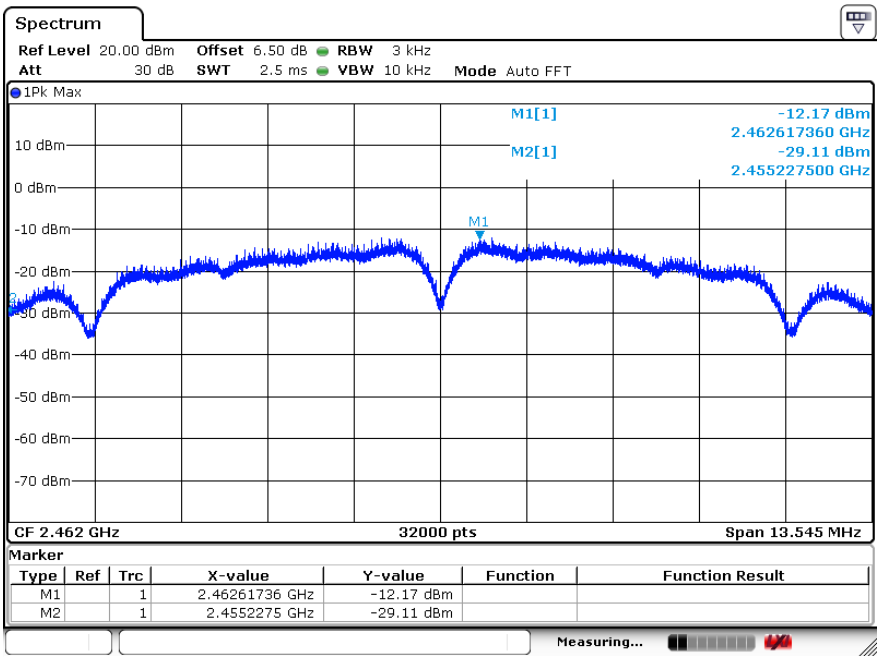
802.11 B Mode CH1



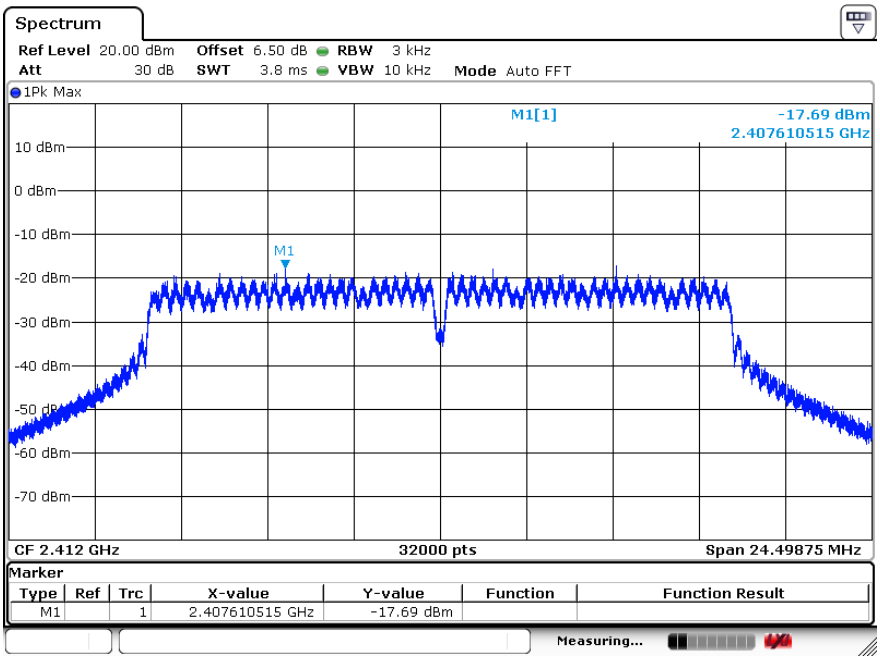

802.11 B Mode CH6



802.11 B Mode CH11




802.11 G Mode CH1



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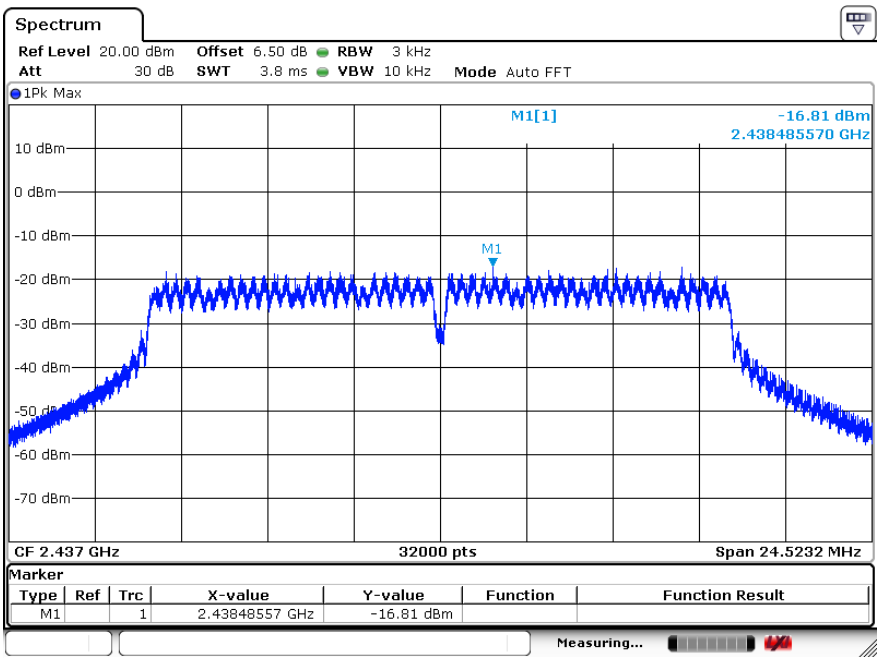


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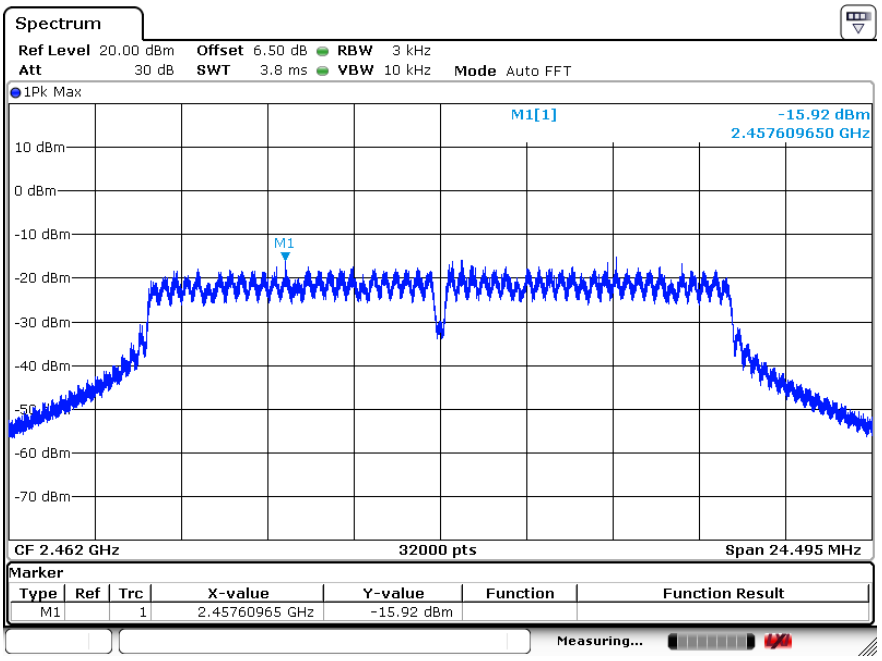
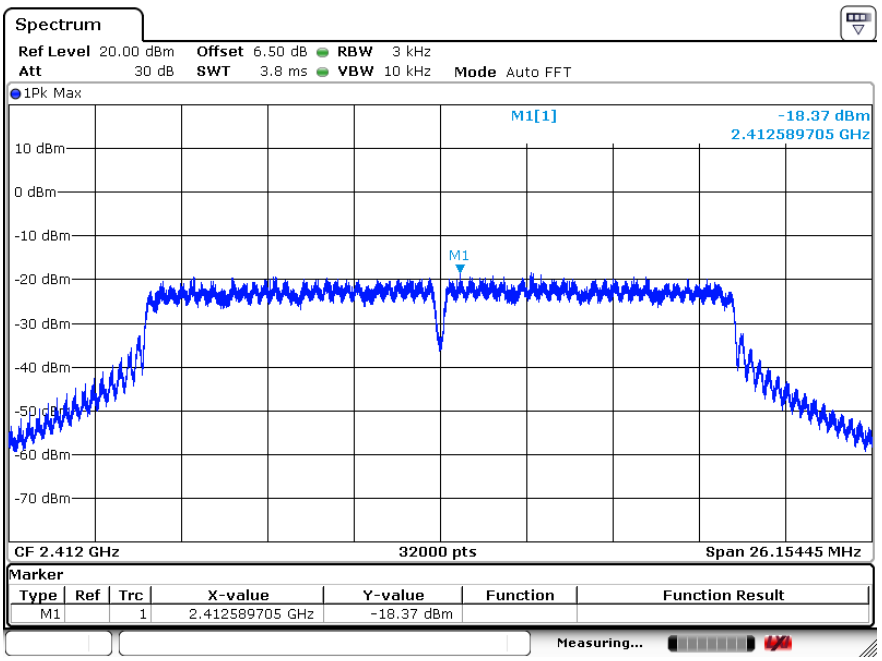
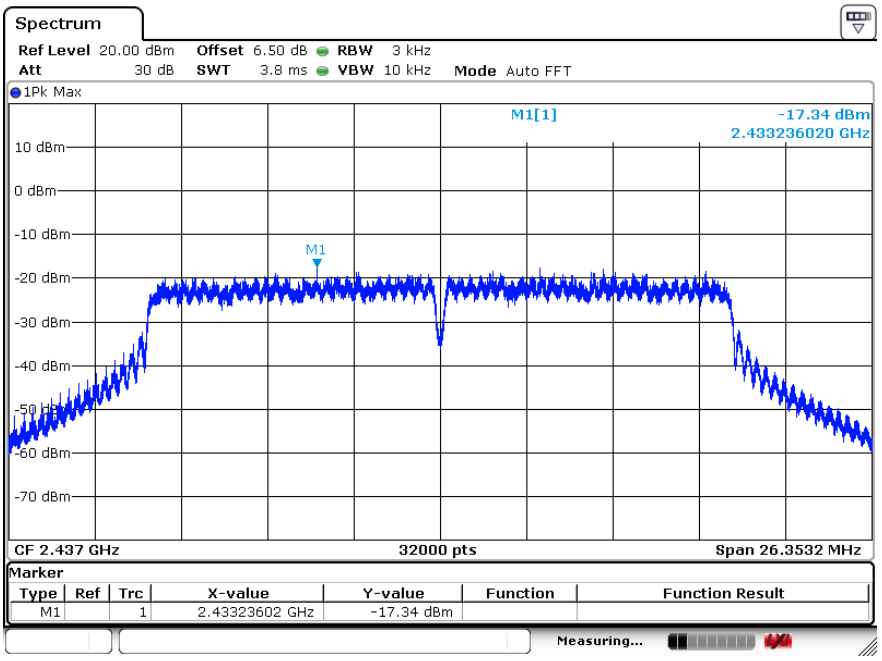


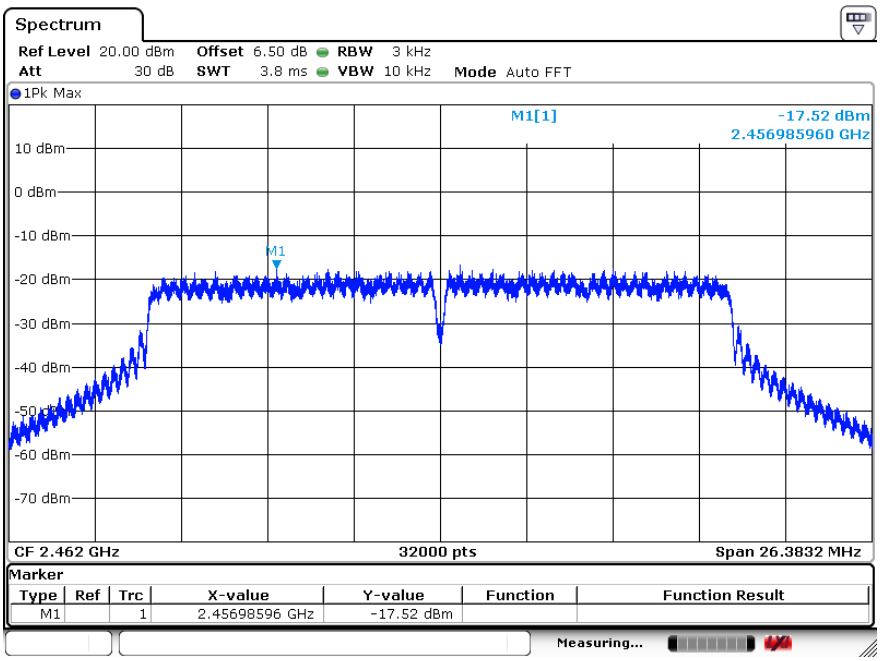
802.11 N20 Mode CH1



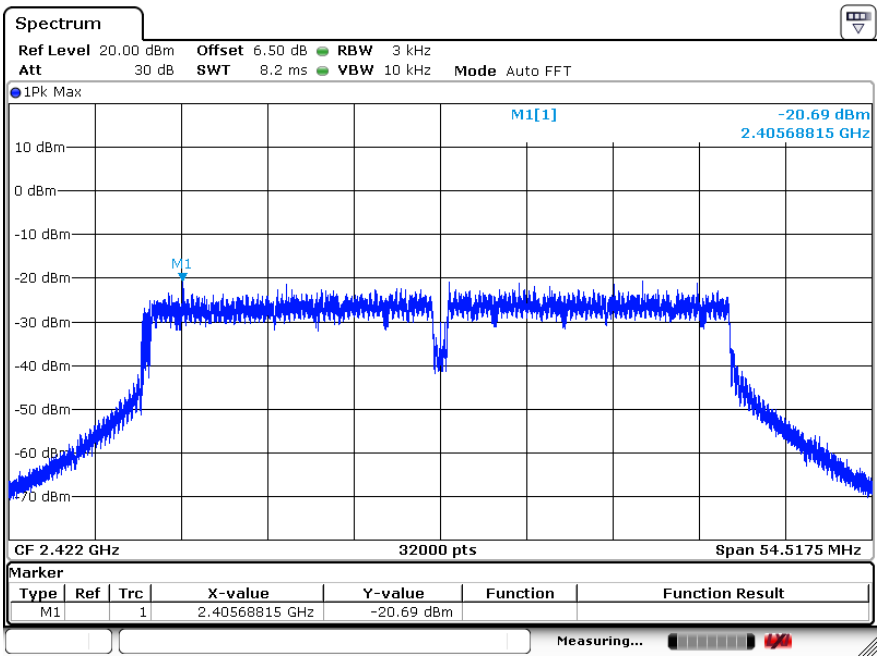

802.11 N20 Mode CH6



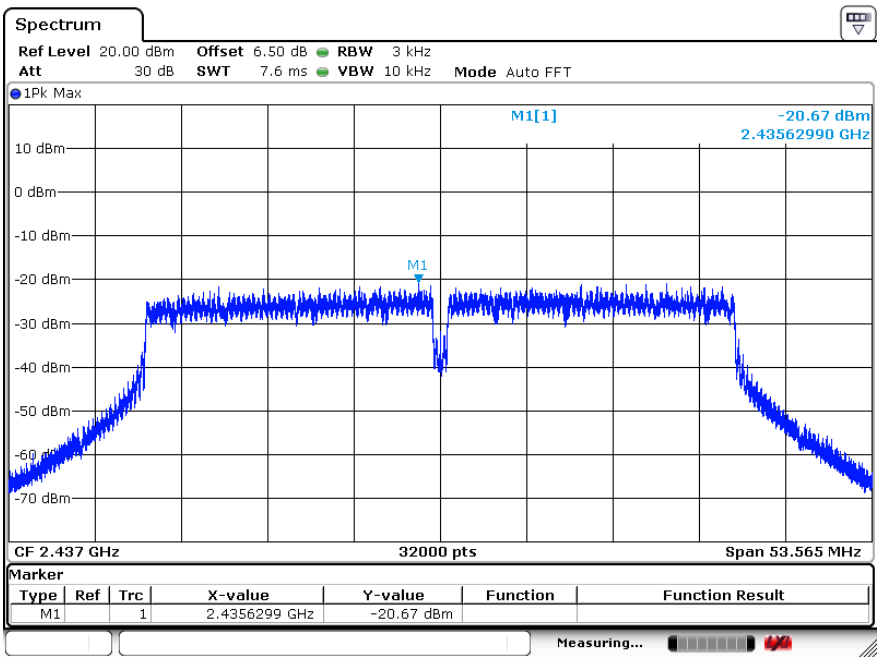
802.11 N20 Mode CH11



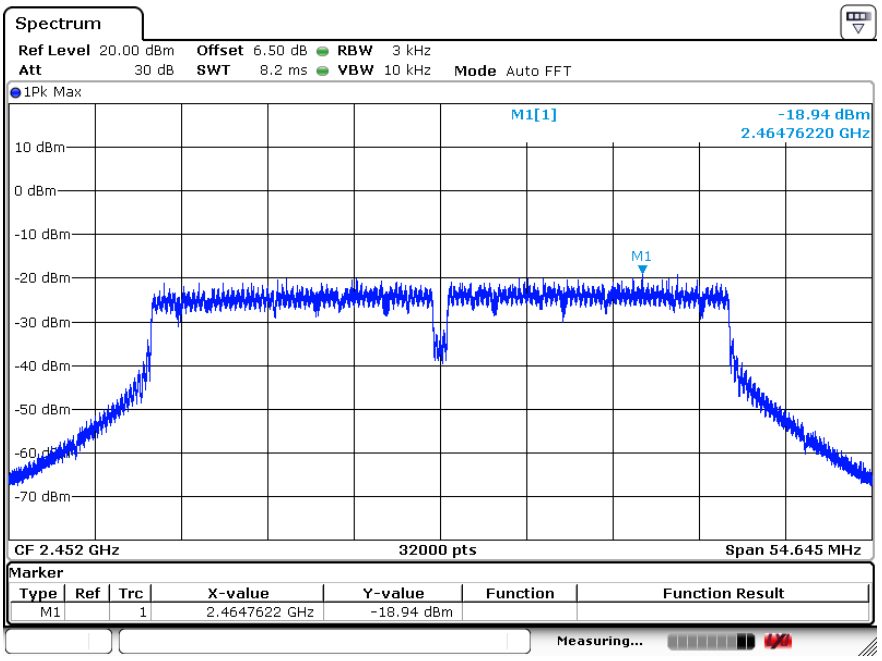

802.11 N40 Mode CH3



802.11 N40 Mode CH6




802.11 N40 Mode CH9



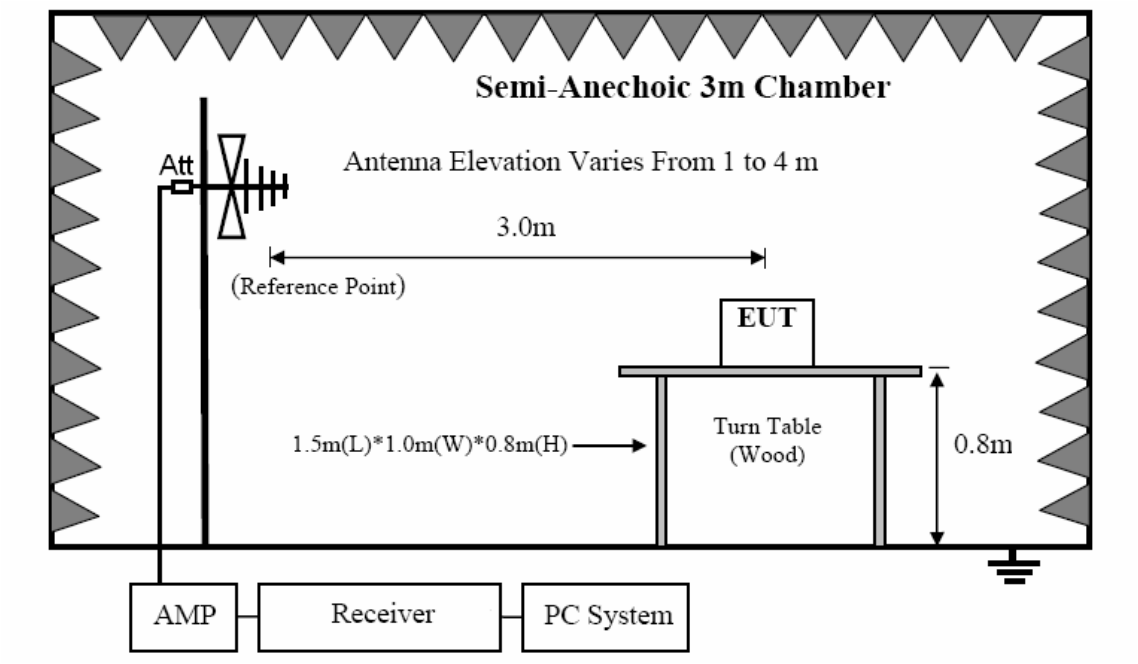
# 6. Spurious Emissions

## 6.1. Test equipment

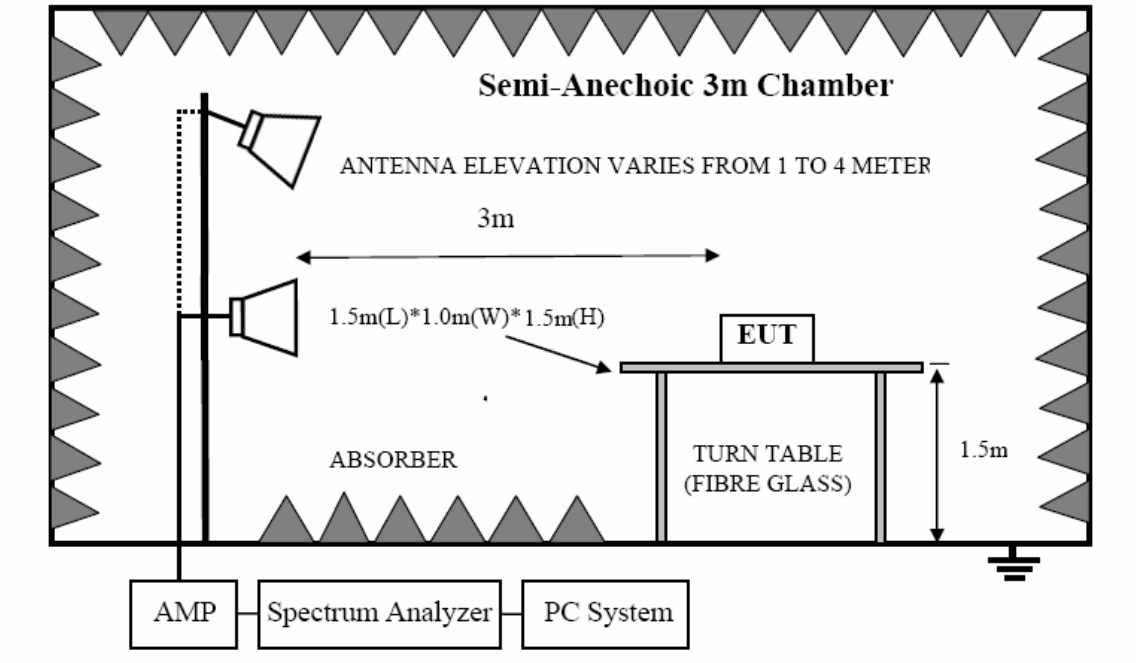
| Item | Equipment | Manufacturer | Model No. | Serial No. | Calibrated until | Calibrated Date |
|---|---|---|---|---|---|---|
| 1 | EMI Test Receiver | R&S | ESCI | 101307 | 12/17/2019 | 12/18/2018 |
| 2 | Spectrum analyzer | Agilent | E4407B | US40240708 | 07/04/2019 | 07/05/2018 |
| 3 | Trilog Broadband Antenna | Schwarzbeck | VULB9168 | VULB9168 -192 | 03/04/2019 | 03/05/2019 |
| 4 | Double Ridged Horn Antenna | SCHWARZBECK | BBHA 9120D1065 | 100276 | 12/17/2019 | 12/18/2018 |
| 5 | Double Ridged Horn Antenna | SCHWARZBECK | BBHA 9120D1065 | 100546 | 12/17/2019 | 12/18/2018 |
| 6 | Dipole antenna | Schwarzbeck | UHAP | 1101 | 12/17/2019 | 12/18/2018 |
| 7 | Dipole antenna | Schwarzbeck | VHAP | 1118 | 12/17/2019 | 12/18/2018 |
| 8 | Pre-Amplifier | CY | EMC011830 | 980136 | 12/17/2019 | 12/18/2018 |
| 9 | Pre-amplifier | HP | 8447F | 3113A05680 | 12/17/2019 | 12/18/2018 |
| 10 | RF Cable | R&S | R01 | 10403 | 12/17/2019 | 12/18/2018 |
| 11 | RF Cable | R&S | R02 | 10512 | 12/17/2019 | 12/18/2018 |
| 12 | RF Cable | R&S | R01 | 10454 | 12/17/2019 | 12/18/2018 |
| 13 | RF Cable | R&S | R02 | 10343 | 12/17/2019 | 12/18/2018 |
| 14 | 6 dB Attenuator | EMEC | ATT6000-6-NN | N/A | 11/21/2019 | 11/22/2018 |
| 15 | Turn Table | UC | UC3000 | N/A | N/A | N/A |
| 16 | Antenna Mast | UC | UC3000 | N/A | N/A | N/A |
| 17 | MeasurementSoftware | Farad | EZ-EMC (Ver.ATT-03A) | N/A | N/A | N/A |
| 18 | Loop antenna | TESEQ | HLA6120 | 20129 | 12/17/2019 | 12/18/2018 |

## 6.2. Block diagram of test setup

In 3m Anechoic Chamber Test Setup Diagram for below 1GHz




In 3m Anechoic Chamber Test Setup Diagram for frequency above 1GHz




Note: For harmonic emissions test a appropriate high pass filter was inserted in the input port of AMP.

## 6.3. Limit

6.3.1 FCC 15.205 Restricted frequency band

| MHz | MHz | MHz | GHz |
|---|---|---|---|
| 0.090 - 0.110 | 16.42 - 16.423 | 399.9 - 410 | 4.5 - 5.15 |
| [1]0.495 - 0.505 | 16.69475 - 16.69525 | 608 - 614 | 5.35 - 5.46 |
| 2.1735 - 2.1905 | 16.80425 - 16.80475 | 960 - 1240 | 7.25 - 7.75 |
| 4.125 - 4.128 | 25.5 - 25.67 | 1300 - 1427 | 8.025 - 8.5 |
| 4.17725 - 4.17775 | 37.5 - 38.25 | 1435 - 1626.5 | 9.0 - 9.2 |
| 4.20725 - 4.20775 | 73 - 74.6 | 1645.5 - 1646.5 | 9.3 - 9.5 |
| 6.215 - 6.218 | 74.8 - 75.2 | 1660 - 1710 | 10.6 - 12.7 |
| 6.26775 - 6.26825 | 108 - 121.94 | 1718.8 - 1722.2 | 13.25 - 13.4 |
| 6.31175 - 6.31225 | 123 - 138 | 2200 - 2300 | 14.47 - 14.5 |
| 8.291 - 8.294 | 149.9 - 150.05 | 2310 - 2390 | 15.35 - 16.2 |
| 8.362 - 8.366 | 156.52475 - 156.52525 | 2483.5 - 2500 | 17.7 - 21.4 |
| 8.37625 - 8.38675 | 156.7 - 156.9 | 2690 - 2900 | 22.01 - 23.12 |
| 8.41425 - 8.41475 | 162.0125 - 167.17 | 3260 - 3267 | 23.6 - 24.0 |
| 12.29 - 12.293 | 167.72 - 173.2 | 3332 - 3339 | 31.2 - 31.8 |
| 12.51975 - 12.52025 | 240 - 285 | 3345.8 - 3358 | 36.43 - 36.5 |
| 12.57675 - 12.57725 | 322 - 335.4 | 3600 - 4400 | ([2]) |

6.3.2 FCC 15.209 Limit

| FREQUENCY MHz | DISTANCE Meters | FIELD STRENGTHS LIMIT | |
|---|---|---|---|
| | | μV/m | dB(μV)/m |
| 30 ~ 88 | 3 | 100 | 40.0 |
| 88 ~ 216 | 3 | 150 | 43.5 |
| 216 ~ 960 | 3 | 200 | 46.0 |
| 960 ~ 1000 | 3 | 500 | 54.0 |
| Above 1000 | 3 | 74.0 dB(μV)/m (Peak)<br>54.0 dB(μV)/m (Average) | |

6.3.3 Limit for this EUT

The radiated emission tests were performed in the 3 meters test site, using the setup accordance with the

ANSI C63.10:2013. The specification used was the FCC 15.209, and FCC 15.247 limits.

## 6.4. TEST PROCEDURE

(1) EUT was placed on a non-metallic table, 80 cm above the ground plane inside a semi-anechoic chamber.

(2) Setup EUT and assistant system according clause 2.4 and 8.2

(3) Test antenna was located 3m from the EUT on an adjustable mast. Below pre-scan procedure was first performed in order to find prominent radiated emissions.

(a) Change work frequency or channel of device if practicable.

(b) Change modulation type of device if practicable.

(c) Change power supply range from 85% to 115% of the rated supply voltage

(d) Rotated EUT though three orthogonal axes to determine the attitude of EUT arrangement produces highest emissions

(4) Spectrum frequency from 9MHz to 25GHz (tenth harmonic of fundamental frequency) was investigated, and no any obvious emission were detected from 9KHz to 30MHz and 18GHz to 25GHz, so below final test was performed with frequency range from 30MHz to 18GHz.

(5) For final emissions measurements at each frequency of interest, the EUT were rotated and the antenna

height was varied between 1m and 4m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. In order to find the maximum emission, the relative positions of equipments and all of the interface cables were changed according to ANSI C63.10 2013 on Radiated Emission test.

(6) For emissions from 30MHz to 1GHz, Quasi-Peak values were measured with EMI Receiver and the bandwidth of Receiver is 120 KHz.

(7)For emissions above 1GHz, both Peak and Average level were measured with Spectrum Analyzer, and the RBW is set at 1MHz, VBW is set at 3MHz for Peak measure, Detector is at PK; RBW is set at 1MHz, VBW is set at 3MHz for Average measure, Detector is at RMS..

## 6.5. TEST RESULT

**Below 30M**

| | | | |
|---|---|---|---|
| **EUT:** | Service-Ready Access Point | **Model No.:** | RA345 |
| **Temperature:** | 24℃ | **Relative Humidity:** | 55% |
| **Distance:** | 3m | **Test Power:** | 120V/60Hz |
| **Polarization:** | -- | **Test Result:** | Pass |
| **Test Mode:** | Keep TX Mode | **Test By:** | smile |

| Freq. | Reading | Limit | Margin | State |
|---|---|---|---|---|
| (MHz) | (dBuV/m) | (dBuV/m) | (dB) | P/F |
| -- | -- | -- | -- | P |
| -- | -- | -- | -- | P |

Note:

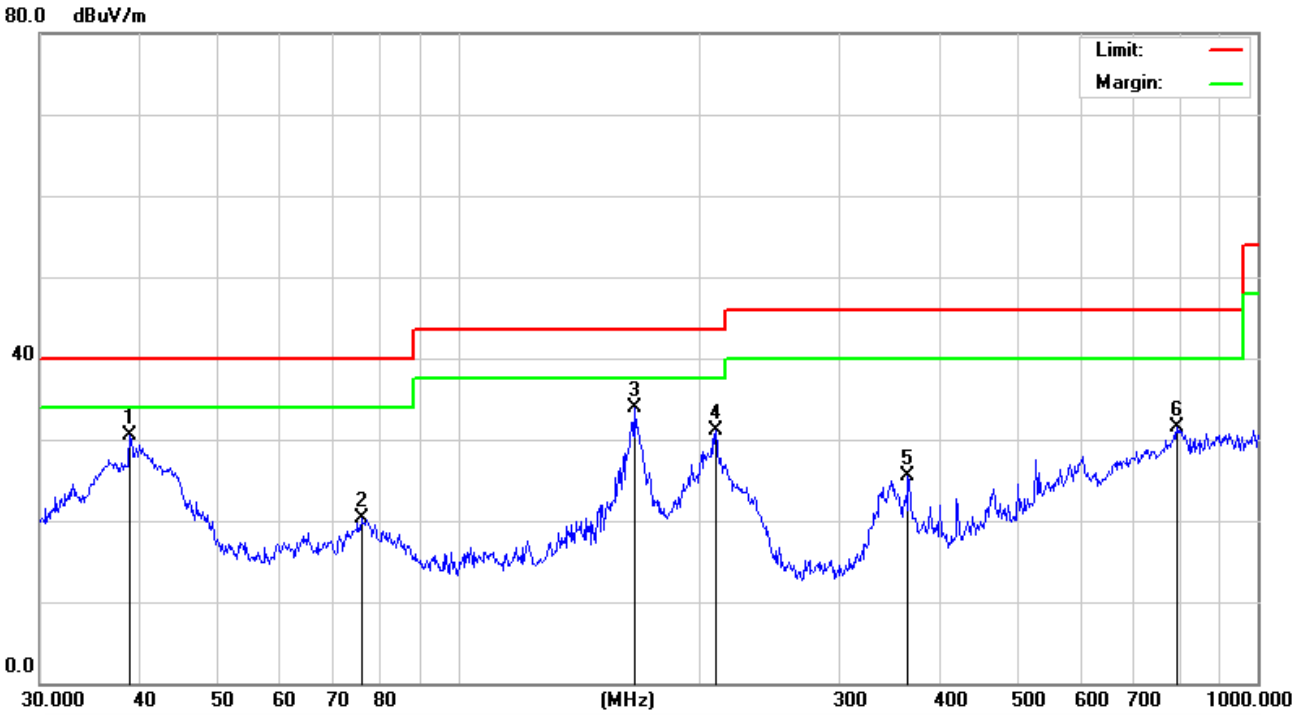
The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

Distance extrapolation factor =20 log (specific distance/test distance)(dB);

Limit line = specific limits(dBuv) + distance extrapolation factor

## Between 30M – 1000 MHz

| | | | |
|---|---|---|---|
| **EUT:** | Service-Ready Access Point | **Model No.:** | RA345 |
| **Temperature:** | 24 | **Relative Humidity:** | 55% |
| **Distance:** | 3m | **Test Power:** | 120V/60Hz |
| **Polarization:** | Vertical | **Test Result:** | Pass |
| **Standard:** | (RE)FCC PART 15 class B 3m | **Test By:** | smile |
| **Test Mode:** | Keep TX Mode | | |

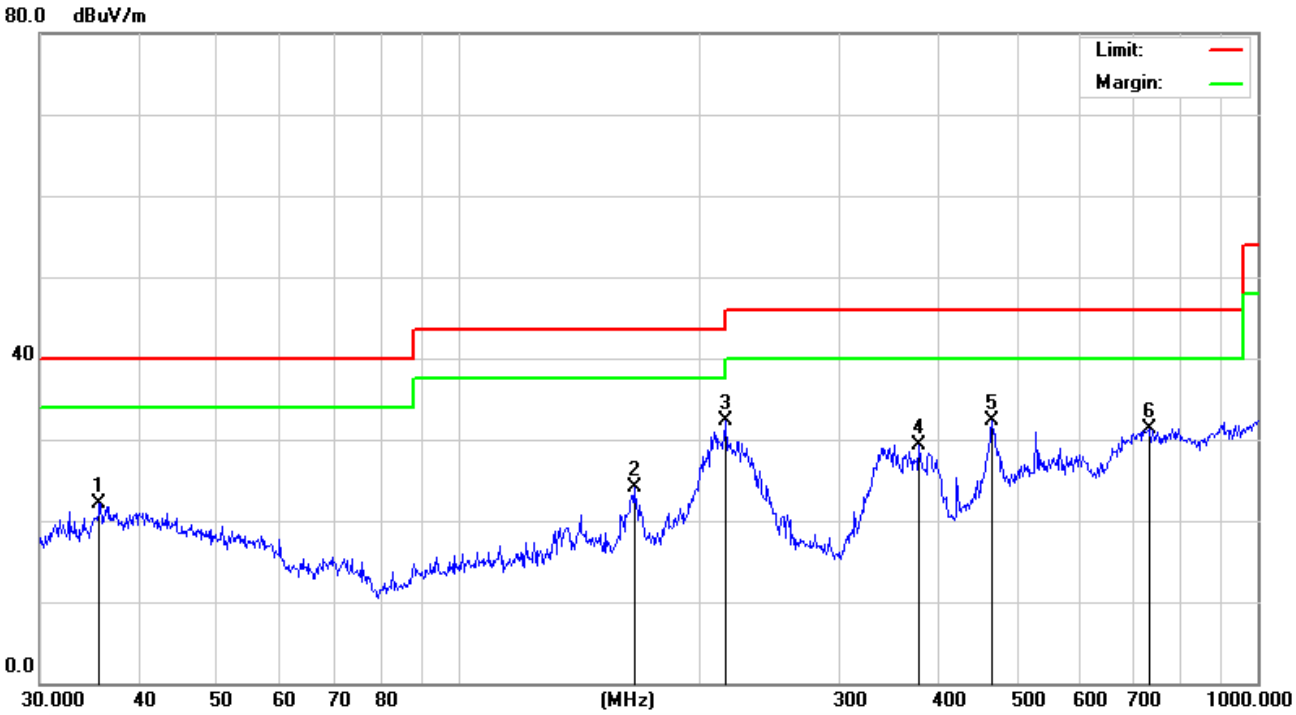



| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector |
| 1 | * | 38.8878 | 34.76 | -4.33 | 30.43 | 40.00 | -9.57 | QP |
| 2 | | 75.7114 | 30.70 | -10.43 | 20.27 | 40.00 | -19.73 | QP |
| 3 | | 166.0680 | 42.83 | -8.97 | 33.86 | 43.50 | -9.64 | QP |
| 4 | | 210.0482 | 34.89 | -3.75 | 31.14 | 43.50 | -12.36 | QP |
| 5 | | 365.5391 | 29.79 | -4.26 | 25.53 | 46.00 | -20.47 | QP |
| 6 | | 793.3960 | 23.75 | 7.69 | 31.44 | 46.00 | -14.56 | QP |

The test result is calculated as the following:

(1) Result = Reading + Correct Factor
(2) Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain + Attenuator
(3) Margin = Result - Limit

| | | | |
|---|---|---|---|
| **EUT:** | Service-Ready Access Point | **Model No.:** | RA345 |
| **Temperature:** | 24 | **Relative Humidity:** | 55% |
| **Distance:** | 3m | **Test Power:** | 120V/60Hz |
| **Polarization:** | Horizontal | **Test Result:** | Pass |
| **Standard:** | (RE)FCC PART 15 class B 3m | **Test By:** | smile |
| **Test Mode:** | Keep TX Mode | | |




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV/m | dBuV/m | dB | Detector |
| 1 | | 35.6240 | 25.66 | -3.52 | 22.14 | 40.00 | -17.86 | QP |
| 2 | | 166.0680 | 31.50 | -7.49 | 24.01 | 43.50 | -19.49 | QP |
| 3 | | 216.0240 | 39.11 | -6.89 | 32.22 | 46.00 | -13.78 | QP |
| 4 | | 377.2591 | 34.15 | -4.91 | 29.24 | 46.00 | -16.76 | QP |
| 5 | * | 465.5994 | 32.15 | 0.15 | 32.30 | 46.00 | -13.70 | QP |
| 6 | | 731.9203 | 24.19 | 7.13 | 31.32 | 46.00 | -14.68 | QP |

The test result is calculated as the following:

(1) Result = Reading + Correct Factor
(2) Correct Factor = Antenna Factor + Cable Loss – Amplifier Gain + Attenuator
(3) Margin = Result - Limit

## Between 1000M – 25000 MHz

| | | | | | |
|---|---|---|---|---|---|
| **Test Site** | : | 3m Chamber | | | |
| **EUT** | : | Service-Ready Access Point | **Tested By** | : | Smile |
| **Power Supply** | : | 12 Vdc | **Model Number** | : | RA345 |
| **Condition** | : | Temp:24.5'C,Humi:55%, Press:100.1kPa | **Test Mode** | : | Tx mode |
| **Memo** | : | 802.11B | **Antenna/Distance** | : | |

| **Frequency** | **Receiver** | | **Rx Antenna** | | **Corrected Amplitude** | **FCC 15.247** | |
|---|---|---|---|---|---|---|---|
| **(MHz)** | **Reading (dBμV)** | **Detector (PK/QP/AV)** | **Polar (H/V)** | **Factor (dB)** | **(dBμV/m)** | **Limit (dBμV/m)** | **Margin (dB)** |
| Low Channel (2412) | | | | | | | |
| 2390 | 42.27 | PK | H | -5.79 | 36.48 | 74 | -37.52 |
| 2390 | 30.23 | AV | H | -5.79 | 24.44 | 54 | -29.56 |
| 2390 | 42.37 | PK | V | -5.79 | 36.58 | 74 | -37.42 |
| 2390 | 30.23 | AV | V | -5.79 | 24.44 | 54 | -29.56 |
| 4824 | 41.90 | PK | H | 5.08 | 46.98 | 74 | -27.02 |
| 4824 | 29.75 | AV | H | 5.08 | 34.83 | 54 | -19.17 |
| 4824 | 42.73 | PK | V | 5.08 | 47.81 | 74 | -26.19 |
| 4824 | 30.04 | AV | V | 5.08 | 35.12 | 54 | -18.88 |
| Middle Channel (2437) | | | | | | | |
| 4874 | 41.95 | PK | H | 5.73 | 47.68 | 74 | -26.32 |
| 4874 | 30.26 | AV | H | 5.73 | 35.99 | 54 | -18.01 |
| 4874 | 42.29 | PK | V | 5.73 | 48.02 | 74 | -25.98 |
| 4874 | 30.13 | AV | V | 5.73 | 35.86 | 54 | -18.14 |
| High Channel (2462) | | | | | | | |
| 2483.5 | 40.32 | PK | H | -4.98 | 35.34 | 74 | -38.66 |
| 2483.5 | 30.26 | AV | H | -4.98 | 25.28 | 54 | -28.72 |
| 2483.5 | 41.72 | PK | V | -4.98 | 36.74 | 74 | -37.26 |
| 2483.5 | 30.22 | AV | V | -4.98 | 25.24 | 54 | -28.76 |
| 4924 | 40.31 | PK | H | 5.18 | 45.49 | 74 | -28.51 |
| 4924 | 30.22 | AV | H | 5.18 | 35.40 | 54 | -18.60 |
| 4924 | 40.73 | PK | V | 5.18 | 45.91 | 74 | -28.09 |
| 4924 | 31.17 | AV | V | 5.18 | 36.35 | 54 | -17.65 |

The test result is calculated as the following:

(1) Corrected Amplitude = Read Level + Antenna Factor + Cable loss -Amplifier Gain

(2) Margin= Corrected Amplitude-Limit

| | | | | | |
|---|---|---|---|---|---|
| **Test Site** | : | 3m Chamber | | | |
| **EUT** | : | Service-Ready Access Point | **Tested By** | : | Smile |
| **Power Supply** | : | 12 Vdc | **Model Number** | : | RA345 |
| **Condition** | : | Temp:24.5'C,Humi:55%, Press:100.1kPa | **Test Mode** | : | Tx mode |
| **Memo** | : | 802.11G | **Antenna/Distance** | : | |

| **Frequency** | **Receiver** | | **Rx Antenna** | | **Corrected Amplitude** | **FCC 15.247** | |
|---|---|---|---|---|---|---|---|
| **(MHz)** | **Reading (dBµV)** | **Detector (PK/QP/AV)** | **Polar (H/V)** | **Factor (dB)** | **(dBµV/m)** | **Limit (dBµV/m)** | **Margin (dB)** |
| Low Channel (2412) | | | | | | | |
| 2390 | 42.56 | PK | H | -5.79 | 36.77 | 74 | -37.23 |
| 2390 | 30.62 | AV | H | -5.79 | 24.83 | 54 | -29.17 |
| 2390 | 42.50 | PK | V | -5.79 | 36.71 | 74 | -37.29 |
| 2390 | 31.09 | AV | V | -5.79 | 25.30 | 54 | -28.70 |
| 4824 | 42.15 | PK | H | 5.08 | 47.23 | 74 | -26.77 |
| 4824 | 30.62 | AV | H | 5.08 | 35.70 | 54 | -18.30 |
| 4824 | 42.80 | PK | V | 5.08 | 47.88 | 74 | -26.12 |
| 4824 | 30.35 | AV | V | 5.08 | 35.43 | 54 | -18.57 |
| Middle Channel (2437) | | | | | | | |
| 4874 | 42.28 | PK | H | 5.73 | 48.01 | 74 | -25.99 |
| 4874 | 30.97 | AV | H | 5.73 | 36.70 | 54 | -17.30 |
| 4874 | 42.39 | PK | V | 5.73 | 48.12 | 74 | -25.88 |
| 4874 | 30.36 | AV | V | 5.73 | 36.09 | 54 | -17.91 |
| High Channel (2462) | | | | | | | |
| 2483.5 | 40.39 | PK | H | -4.98 | 35.41 | 74 | -38.59 |
| 2483.5 | 30.62 | AV | H | -4.98 | 25.64 | 54 | -28.36 |
| 2483.5 | 41.65 | PK | V | -4.98 | 36.67 | 74 | -37.33 |
| 2483.5 | 30.20 | AV | V | -4.98 | 25.22 | 54 | -28.78 |
| 4924 | 40.45 | PK | H | 5.18 | 45.63 | 74 | -28.37 |
| 4924 | 30.40 | AV | H | 5.18 | 35.58 | 54 | -18.42 |
| 4924 | 40.77 | PK | V | 5.18 | 45.95 | 74 | -28.05 |
| 4924 | 31.53 | AV | V | 5.18 | 36.71 | 54 | -17.29 |

The test result is calculated as the following:

(1) Corrected Amplitude = Read Level + Antenna Factor + Cable loss -Amplifier Gain

(2) Margin= Corrected Amplitude-Limit

| | | | | | |
|---|---|---|---|---|---|
| **Test Site** | : | 3m Chamber | | | |
| **EUT** | : | Service-Ready Access Point | **Tested By** | : | Smile |
| **Power Supply** | : | 12 Vdc | **Model Number** | : | RA345 |
| **Condition** | : | Temp:24.5'C,Humi:55%, Press:100.1kPa | **Test Mode** | : | Tx mode |
| **Memo** | : | 802.11N20 | **Antenna/Distance** | : | |

| **Frequency** | **Receiver** | | **Rx Antenna** | | **Corrected Amplitude** | **FCC 15.247** | |
|---|---|---|---|---|---|---|---|
| **(MHz)** | **Reading (dBµV)** | **Detector (PK/QP/AV)** | **Polar (H/V)** | **Factor (dB)** | **(dBµV/m)** | **Limit (dBµV/m)** | **Margin (dB)** |
| Low Channel (2412) | | | | | | | |
| 2390 | 41.73 | PK | H | -5.79 | 35.94 | 74 | -38.06 |
| 2390 | 31.24 | AV | H | -5.79 | 25.45 | 54 | -28.55 |
| 2390 | 42.28 | PK | V | -5.79 | 36.49 | 74 | -37.51 |
| 2390 | 31.70 | AV | V | -5.79 | 25.91 | 54 | -28.09 |
| 4824 | 42.33 | PK | H | 5.08 | 47.41 | 74 | -26.59 |
| 4824 | 30.11 | AV | H | 5.08 | 35.19 | 54 | -18.81 |
| 4824 | 41.82 | PK | V | 5.08 | 46.90 | 74 | -27.10 |
| 4824 | 30.24 | AV | V | 5.08 | 35.32 | 54 | -18.68 |
| Middle Channel (2437) | | | | | | | |
| 4874 | 41.91 | PK | H | 5.73 | 47.64 | 74 | -26.36 |
| 4874 | 30.85 | AV | H | 5.73 | 36.58 | 54 | -17.42 |
| 4874 | 42.20 | PK | V | 5.73 | 47.93 | 74 | -26.07 |
| 4874 | 30.04 | AV | V | 5.73 | 35.77 | 54 | -18.23 |
| High Channel (2462) | | | | | | | |
| 2483.5 | 40.73 | PK | H | -4.98 | 35.75 | 74 | -38.25 |
| 2483.5 | 30.61 | AV | H | -4.98 | 25.63 | 54 | -28.37 |
| 2483.5 | 41.22 | PK | V | -4.98 | 36.24 | 74 | -37.76 |
| 2483.5 | 29.81 | AV | V | -4.98 | 24.83 | 54 | -29.17 |
| 4924 | 40.33 | PK | H | 5.18 | 45.51 | 74 | -28.49 |
| 4924 | 30.17 | AV | H | 5.18 | 35.35 | 54 | -18.65 |
| 4924 | 40.41 | PK | V | 5.18 | 45.59 | 74 | -28.41 |
| 4924 | 30.99 | AV | V | 5.18 | 36.17 | 54 | -17.83 |

The test result is calculated as the following:

(1) Corrected Amplitude = Read Level + Antenna Factor + Cable loss -Amplifier Gain

(2) Margin= Corrected Amplitude-Limit

| | | | | | |
|---|---|---|---|---|---|
| **Test Site** | : | 3m Chamber | | | |
| **EUT** | : | Service-Ready Access Point | **Tested By** | : | Smile |
| **Power Supply** | : | 12 Vdc | **Model Number** | : | RA345 |
| **Condition** | : | Temp:24.5'C,Humi:55%, Press:100.1kPa | **Test Mode** | : | Tx mode |
| **Memo** | : | 802.11N40 | **Antenna/Distance** | : | |

| **Frequency** | **Receiver** | | **Rx Antenna** | | **Corrected Amplitude** | **FCC 15.247** | |
|---|---|---|---|---|---|---|---|
| **(MHz)** | **Reading (dBµV)** | **Detector (PK/QP/AV)** | **Polar (H/V)** | **Factor (dB)** | **(dBµV/m)** | **Limit (dBµV/m)** | **Margin (dB)** |
| Low Channel (2422) | | | | | | | |
| 2390 | 42.20 | PK | H | -5.79 | 36.41 | 74 | -37.59 |
| 2390 | 30.87 | AV | H | -5.79 | 25.08 | 54 | -28.92 |
| 2390 | 42.79 | PK | V | -5.79 | 37.00 | 74 | -37.00 |
| 2390 | 31.54 | AV | V | -5.79 | 25.75 | 54 | -28.25 |
| 4844 | 42.06 | PK | H | 5.08 | 47.14 | 74 | -26.86 |
| 4844 | 30.28 | AV | H | 5.08 | 35.36 | 54 | -18.64 |
| 4844 | 40.99 | PK | V | 5.08 | 46.07 | 74 | -27.93 |
| 4844 | 30.16 | AV | V | 5.08 | 35.24 | 54 | -18.76 |
| Middle Channel (2437) | | | | | | | |
| 4874 | 41.79 | PK | H | 5.73 | 47.52 | 74 | -26.48 |
| 4874 | 30.25 | AV | H | 5.73 | 35.98 | 54 | -18.02 |
| 4874 | 42.59 | PK | V | 5.73 | 48.32 | 74 | -25.68 |
| 4874 | 30.22 | AV | V | 5.73 | 35.95 | 54 | -18.05 |
| High Channel (2452) | | | | | | | |
| 2483.5 | 40.38 | PK | H | -4.98 | 35.40 | 74 | -38.60 |
| 2483.5 | 30.46 | AV | H | -4.98 | 25.48 | 54 | -28.52 |
| 2483.5 | 41.57 | PK | V | -4.98 | 36.59 | 74 | -37.41 |
| 2483.5 | 30.03 | AV | V | -4.98 | 25.05 | 54 | -28.95 |
| 4904 | 40.84 | PK | H | 5.18 | 46.02 | 74 | -27.98 |
| 4904 | 30.09 | AV | H | 5.18 | 35.27 | 54 | -18.73 |
| 4904 | 40.21 | PK | V | 5.18 | 45.39 | 74 | -28.61 |
| 4904 | 29.98 | AV | V | 5.18 | 35.16 | 54 | -18.84 |

The test result is calculated as the following:

(1) Corrected Amplitude = Read Level + Antenna Factor + Cable loss -Amplifier Gain

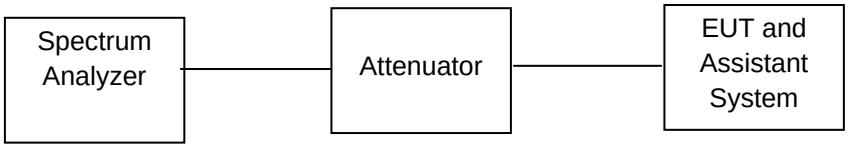
(2) Margin= Corrected Amplitude-Limit

# 7. 100 kHz Bandwidth of Frequency Band Edge

## 7.1. Test equipment

| Item | Equipment | Manufacturer | Model No. | Serial No. | Calibrated until | Calibrated Date |
|---|---|---|---|---|---|---|
| 1 | Spectrum analyzer | KEYSIGHT | N9010A | MY55150427 | 05/25/2019 | 05/26/2018 |
| 2 | Attenuator | Mini-Circuits | BW-S10W2 | 101109 | 12/17/2019 | 12/18/2018 |
| 3 | RF Cable | Micable | C10-01-01-1 | 100309 | 12/17/2019 | 12/18/2018 |
| 4 | Spectrum analyzer | R&S | FSV40 | 101470 | 06/26/2019 | 06/27/2018 |

## 7.2. Block diagram of test setup




## 7.3. Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

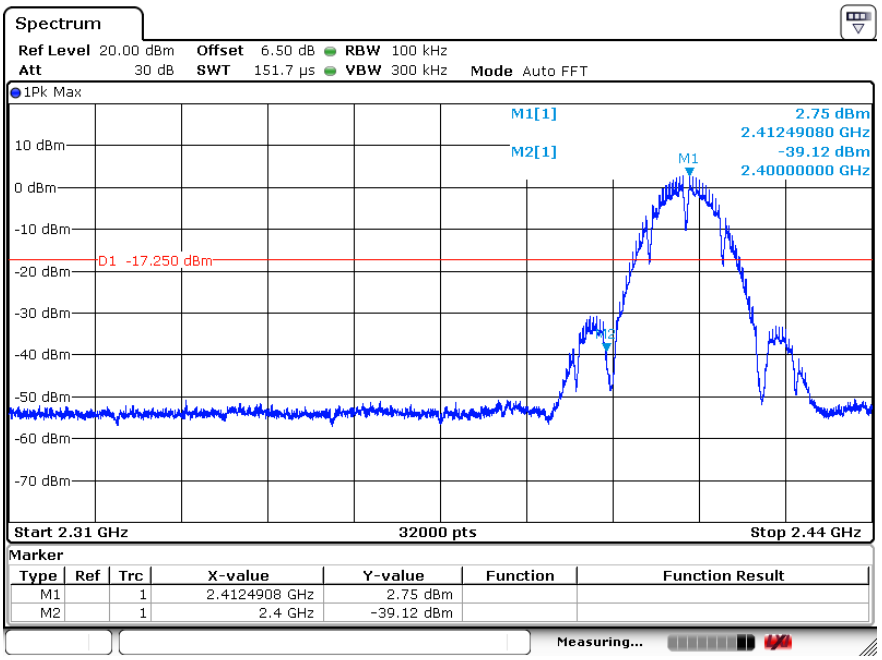
## 7.4. Test Procedure

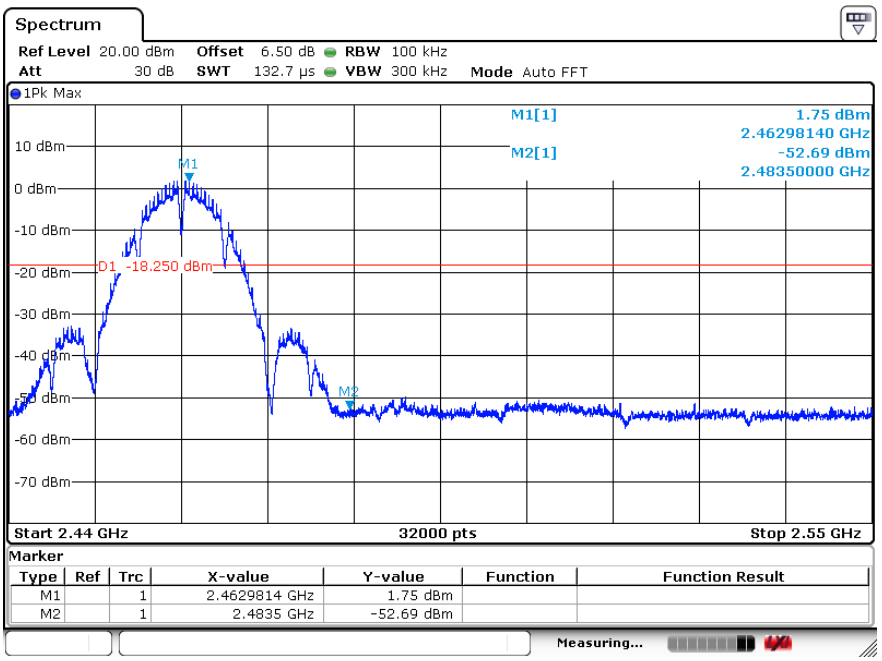
1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Remove the antenna from the EUT and then connect to a low loss RF cable from the antenna port to a EMI test receiver, then turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel within its operating range, and make sure the instrument is operated in its linear range.
3. Set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

## 7.5. Test result

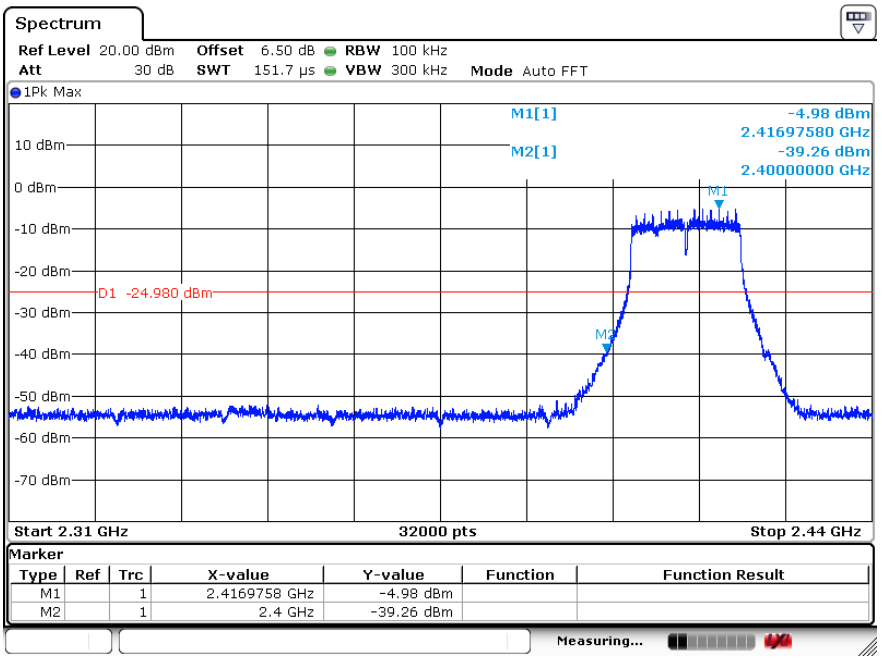
| Frequency Band | Delta Peak to band emission (dBc) | ＞Limit (dBc) | Result |
|---|---|---|---|
| IEEE 802.11B Mdoe | | | |
| 2390 | 41.87 | 20 | Pass |
| 2483.5 | 54.44 | 20 | Pass |
| IEEE 802.11G Mdoe | | | |
| 2390 | 34.28 | 20 | Pass |
| 2483.5 | 50.97 | 20 | Pass |
| IEEE 802.11N20 Mdoe | | | |
| 2390 | 33.68 | 20 | Pass |
| 2483.5 | 51.51 | 20 | Pass |
| IEEE 802.11N40 Mdoe | | | |
| 2390 | 33.81 | 20 | Pass |
| 2483.5 | 46.74 | 20 | Pass |

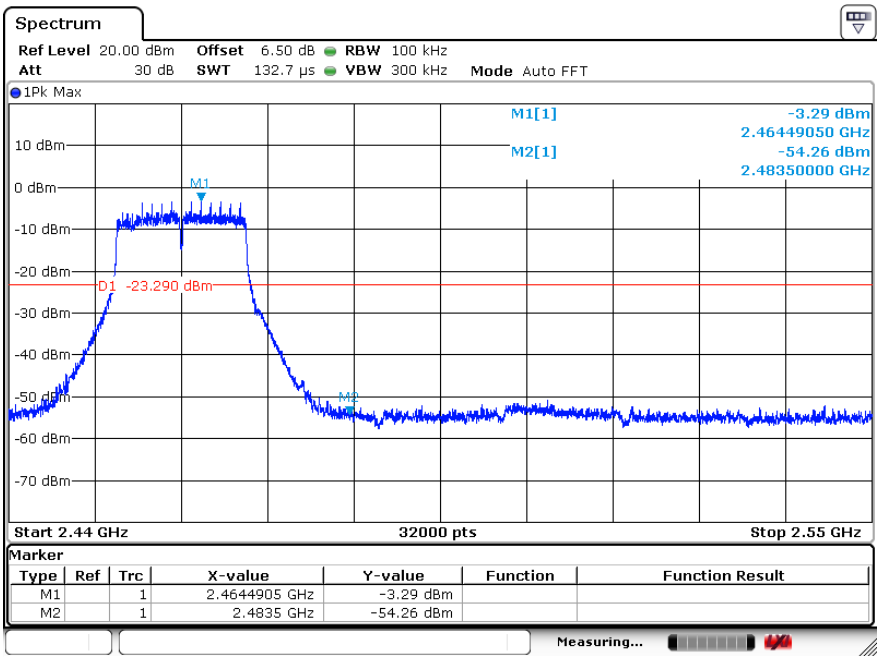
802.11B Mode


Spectrum
Ref Level 20.00 dBm Offset 6.50 dB RBW 100 kHz
Att 30 dB SWT 151.7 µs VBW 300 kHz Mode Auto FFT
1Pk Max
M1[1] 2.75 dBm
2.41249080 GHz
M2[1] -39.12 dBm
2.40000000 GHz
D1 -17.250 dBm
Start 2.31 GHz 32000 pts Stop 2.44 GHz
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 2.4124908 GHz 2.75 dBm
M2 1 2.4 GHz -39.12 dBm
Measuring...

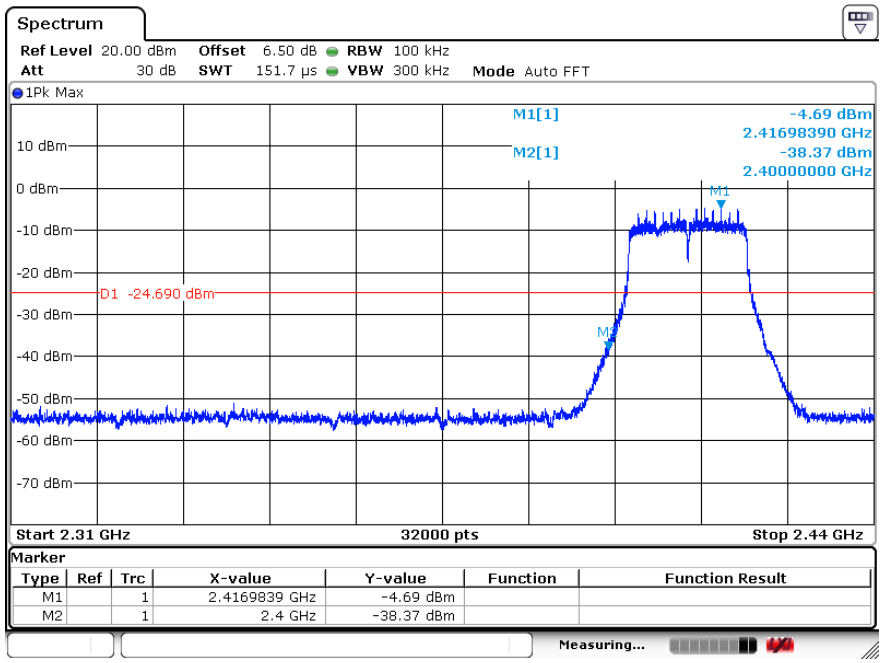

Spectrum
Ref Level 20.00 dBm Offset 6.50 dB RBW 100 kHz
Att 30 dB SWT 132.7 µs VBW 300 kHz Mode Auto FFT
1Pk Max
M1[1] 1.75 dBm
2.46298140 GHz
M2[1] -52.69 dBm
2.48350000 GHz
D1 -18.250 dBm
Start 2.44 GHz 32000 pts Stop 2.55 GHz
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 2.4629814 GHz 1.75 dBm
M2 1 2.4835 GHz -52.69 dBm
Measuring...

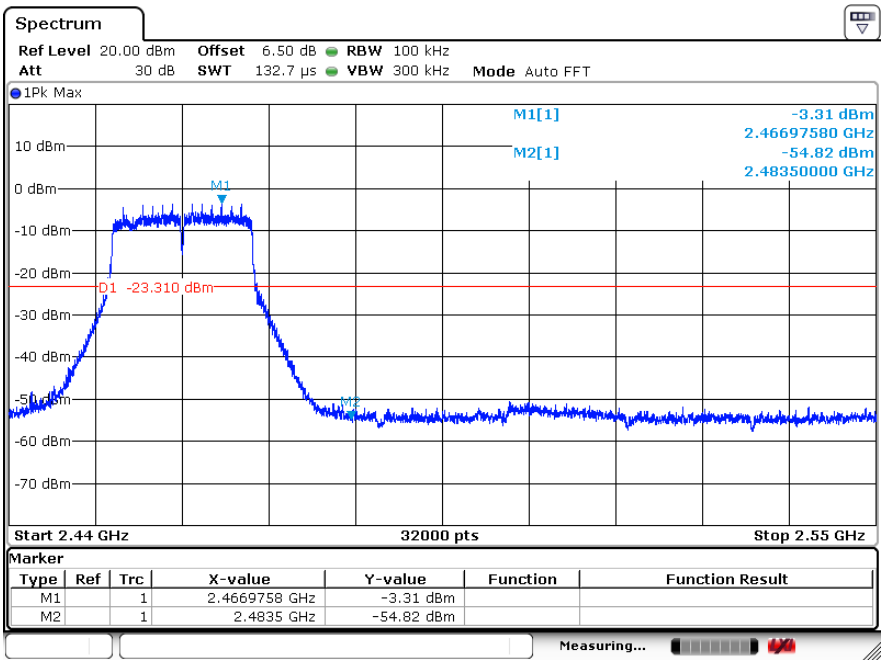
802.11G Mode


Spectrum
Ref Level 20.00 dBm Offset 6.50 dB RBW 100 kHz
Att 30 dB SWT 151.7 µs VBW 300 kHz Mode Auto FFT
1Pk Max
M1[1] -4.98 dBm
2.41697580 GHz
M2[1] -39.26 dBm
2.40000000 GHz
D1 -24.980 dBm
Start 2.31 GHz 32000 pts Stop 2.44 GHz
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 2.4169758 GHz -4.98 dBm
M2 1 2.4 GHz -39.26 dBm
Measuring...

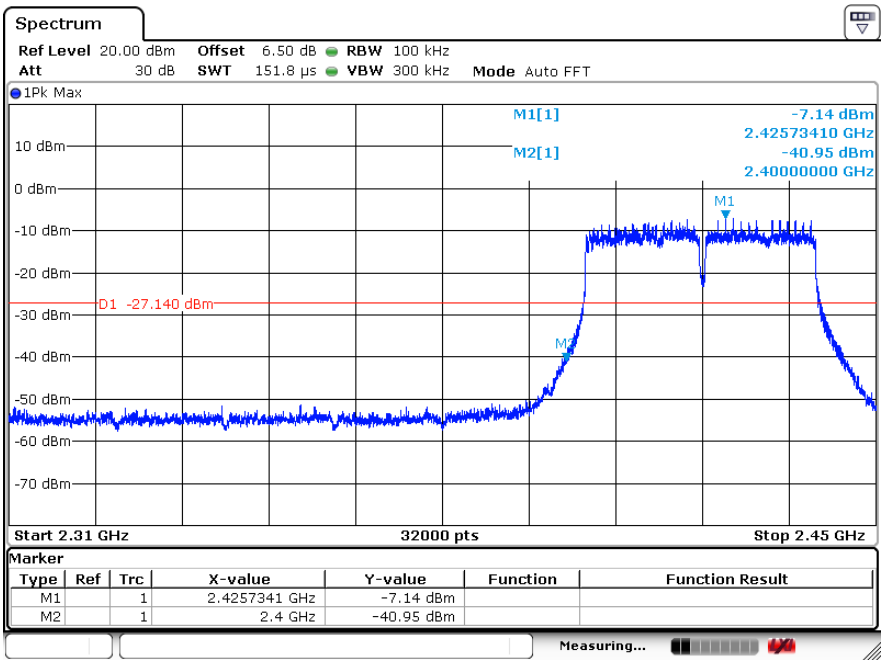

Spectrum
Ref Level 20.00 dBm Offset 6.50 dB RBW 100 kHz
Att 30 dB SWT 132.7 µs VBW 300 kHz Mode Auto FFT
1Pk Max
M1[1] -3.29 dBm
2.46449050 GHz
M2[1] -54.26 dBm
2.48350000 GHz
D1 -23.290 dBm
Start 2.44 GHz 32000 pts Stop 2.55 GHz
Marker
Type Ref Trc X-value Y-value Function Function Result
M1 1 2.4644905 GHz -3.29 dBm
M2 1 2.4835 GHz -54.26 dBm
Measuring...

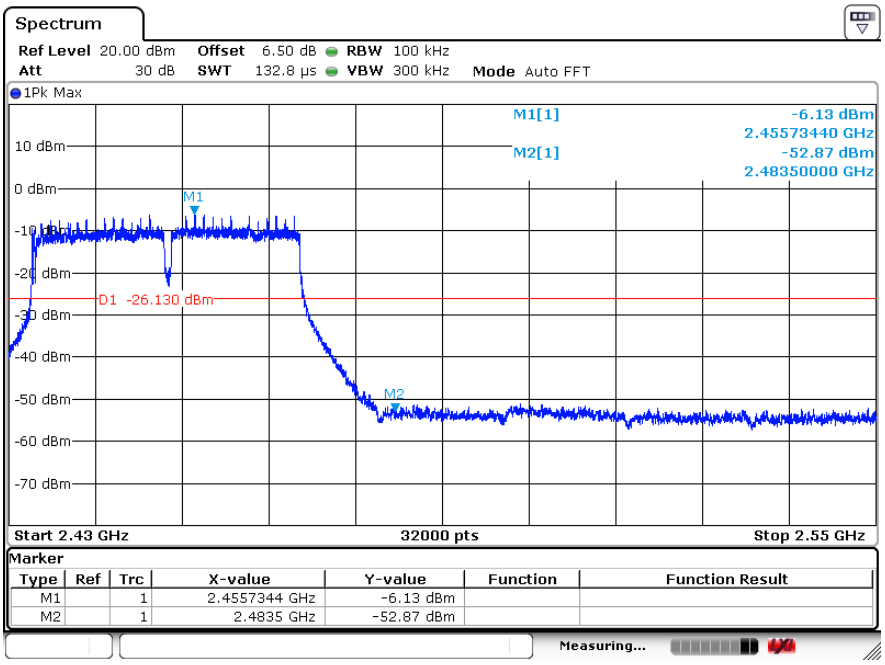
802.11 N20 Mode



802.11 N40 Mode



# 8. Conducted Spurious Emissions

## 8.1. Test Equipment

| Item | Equipment | Manufacturer | Model No. | Serial No. | Calibrated until | Calibrated Date |
|---|---|---|---|---|---|---|
| 1 | Spectrum analyzer | KEYSIGHT | N9010A | MY55150427 | 05/26/2019 | 05/27/2018 |
| 2 | Attenuator | Mini-Circuits | BW-S10W2 | 101109 | 12/17/2019 | 12/18/2018 |
| 3 | RF Cable | Micable | C10-01-01-1 | 100309 | 12/17/2019 | 12/18/2018 |
| 4 | Spectrum analyzer | R&S | FSV40 | 101470 | 06/26/2019 | 06/27/2018 |

## 8.2. Limit

In any 100kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power.

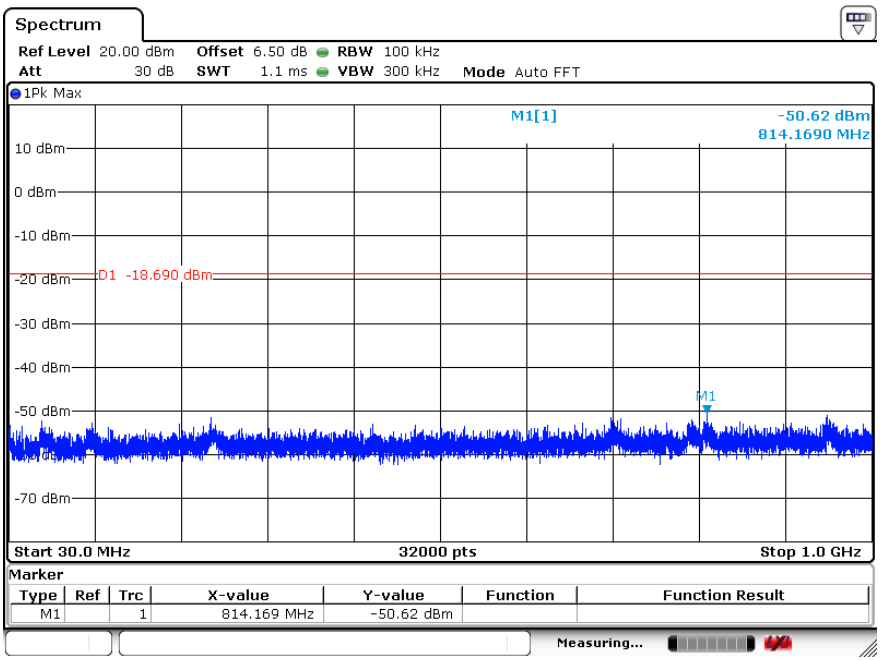
## 8.3. Test Procedure

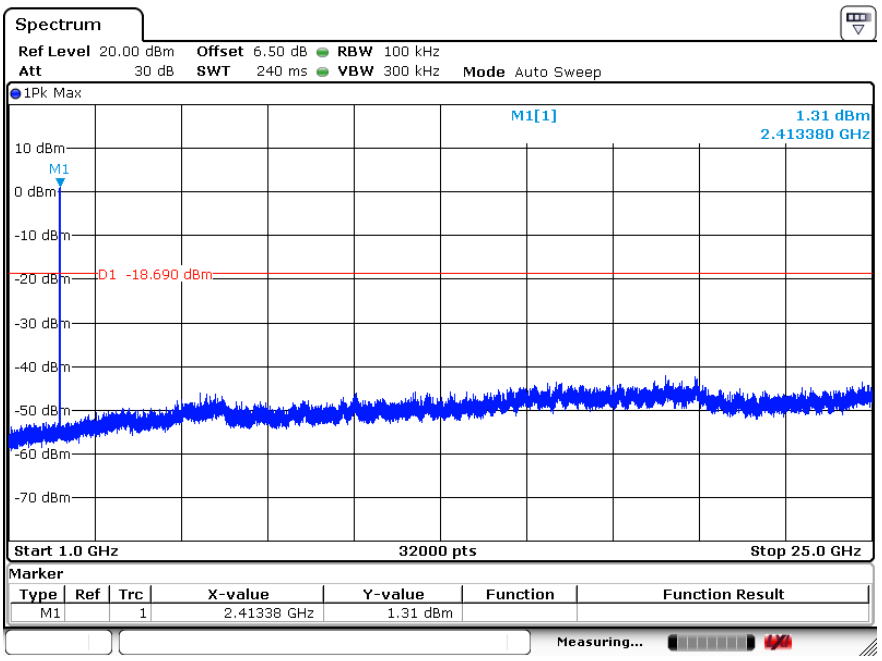
The transmitter output was connected to a spectrum analyzer, The resolution bandwidth is set to 100 kHz, The video bandwidth is set to 300 kHz and measure all the emissions detected.

## 8.4. Test result

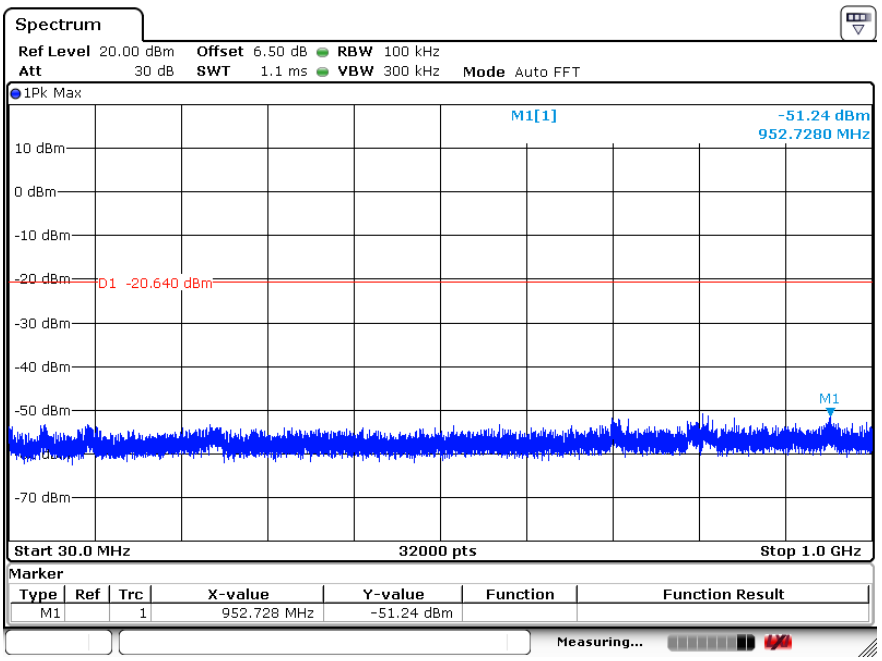
**PASS** (**See below detailed test result**.)

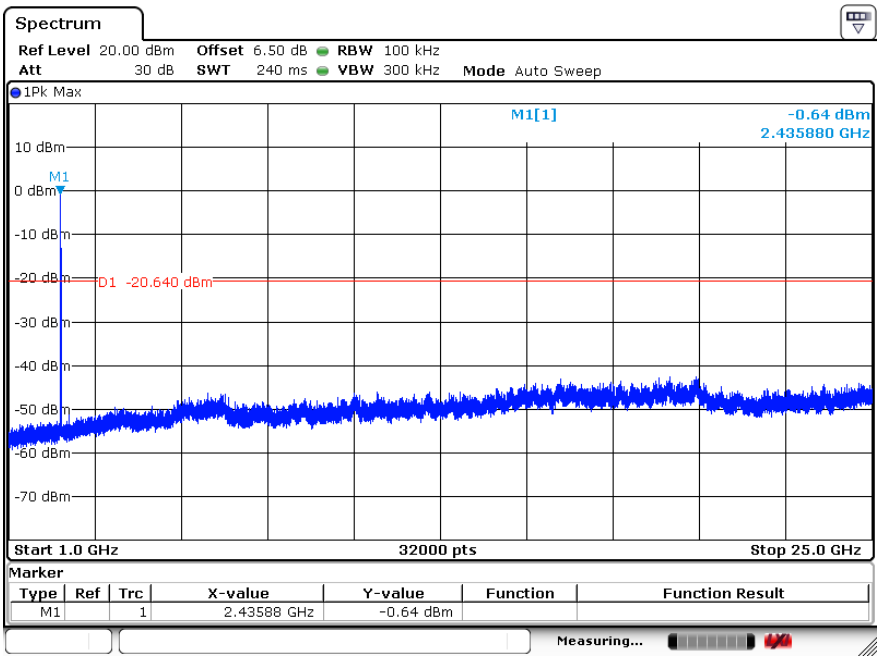
802.11 B Mode CH0



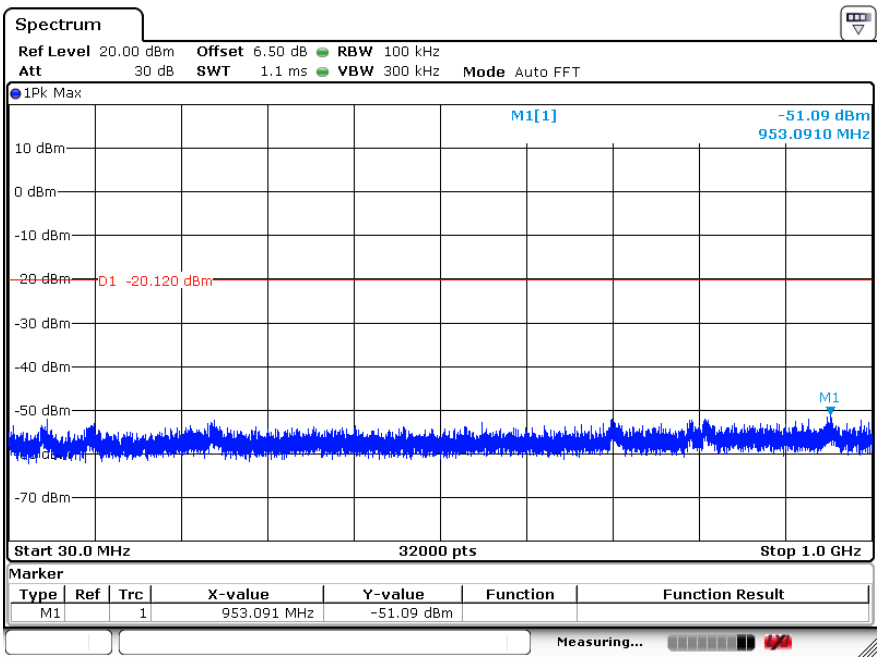



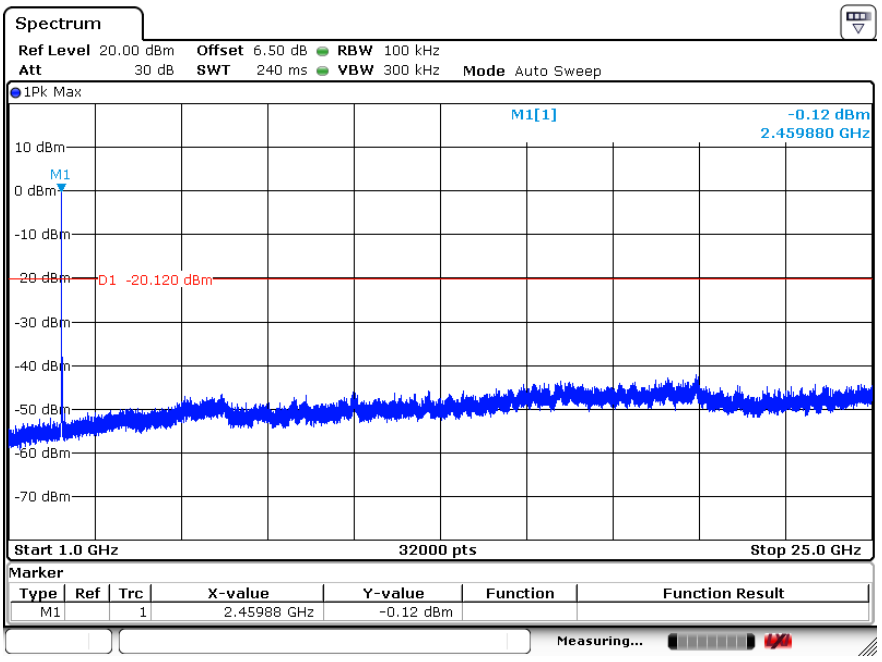
802.11 B Mode CH6



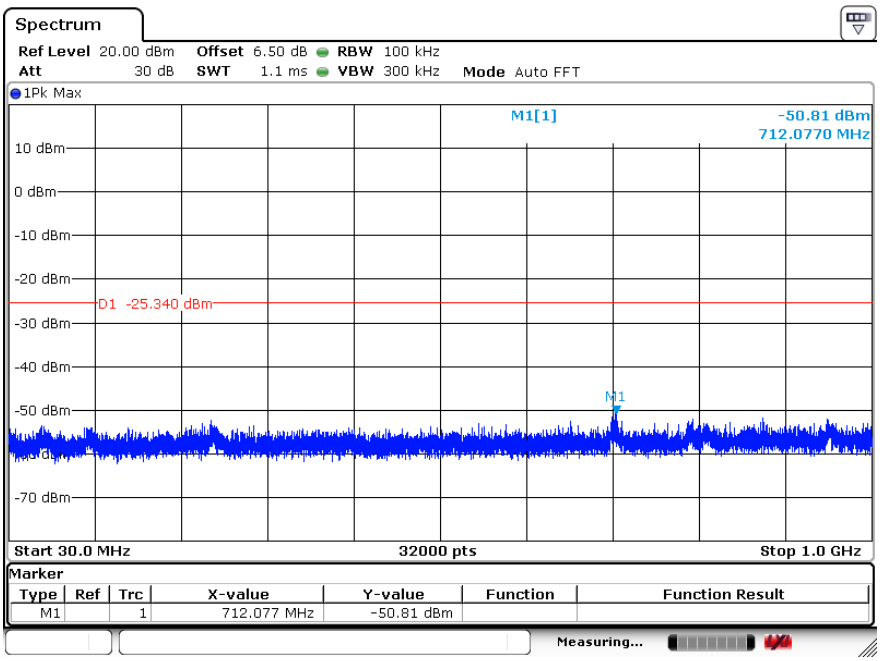



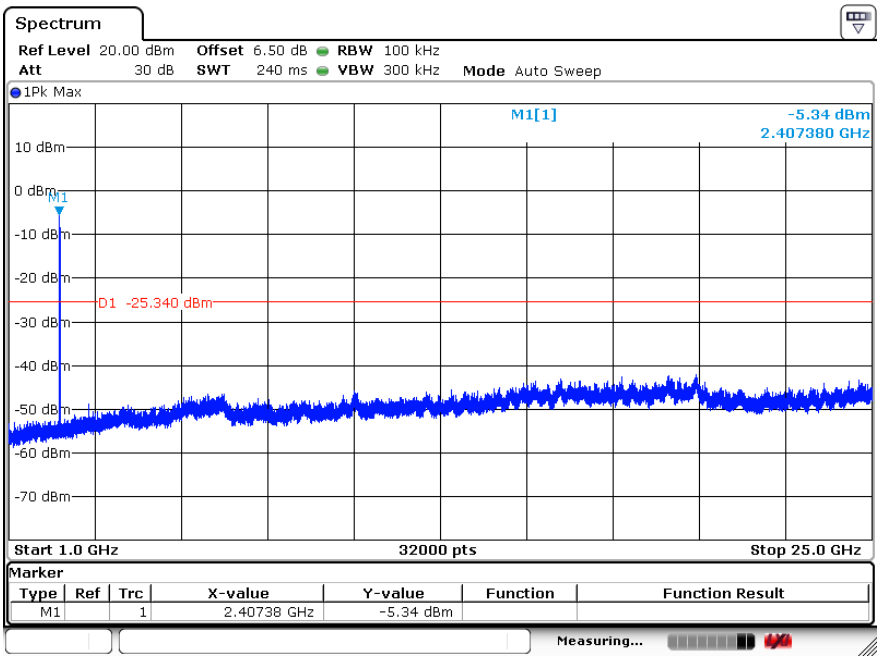
802.11 B Mode CH11



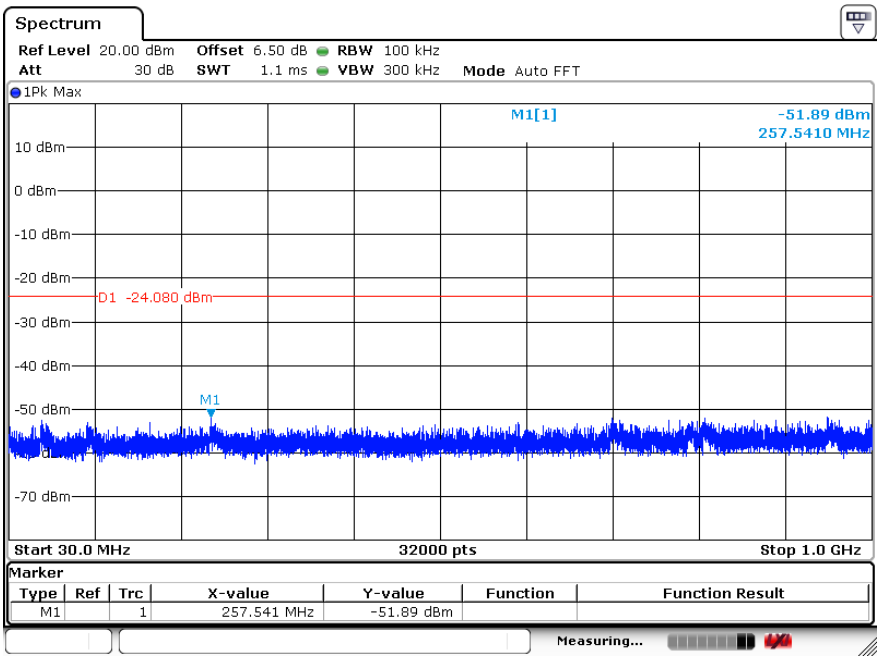



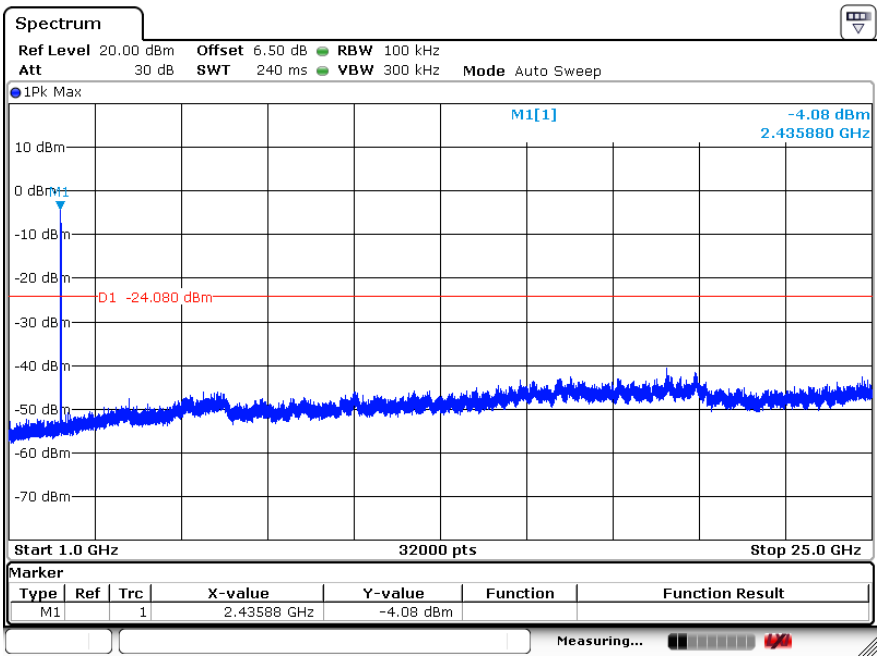
802.11 G Mode CH1



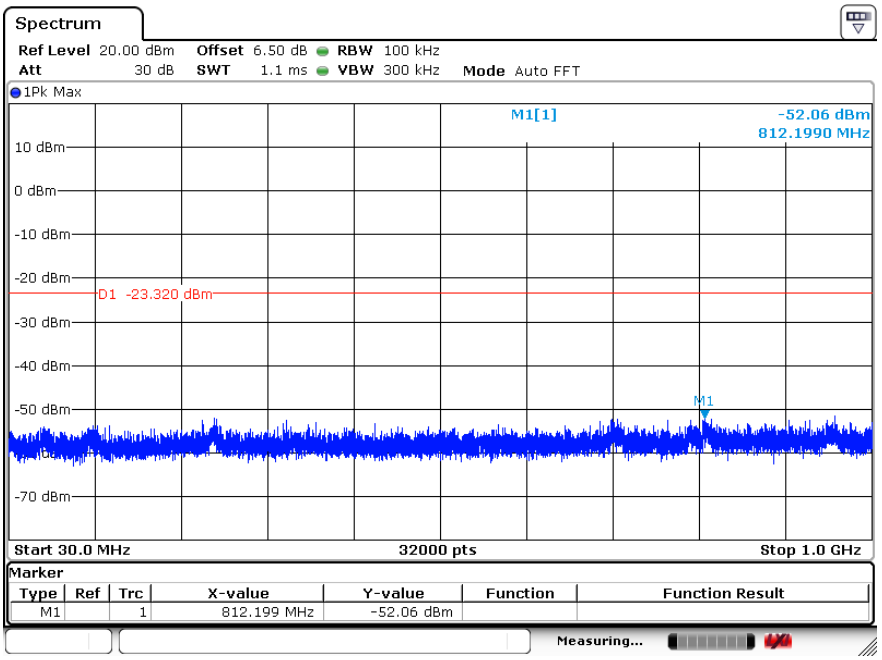



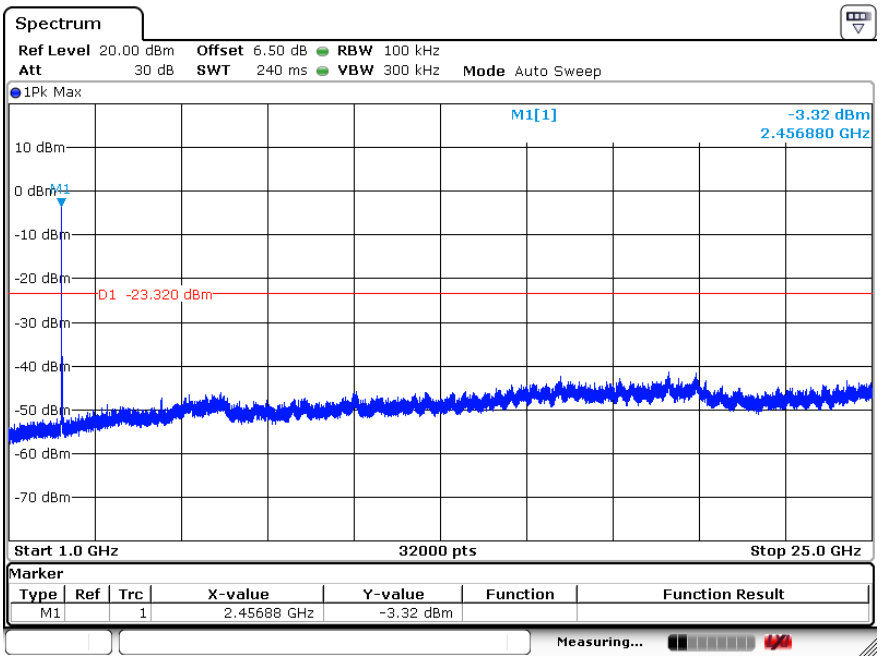
802.11 G Mode CH6



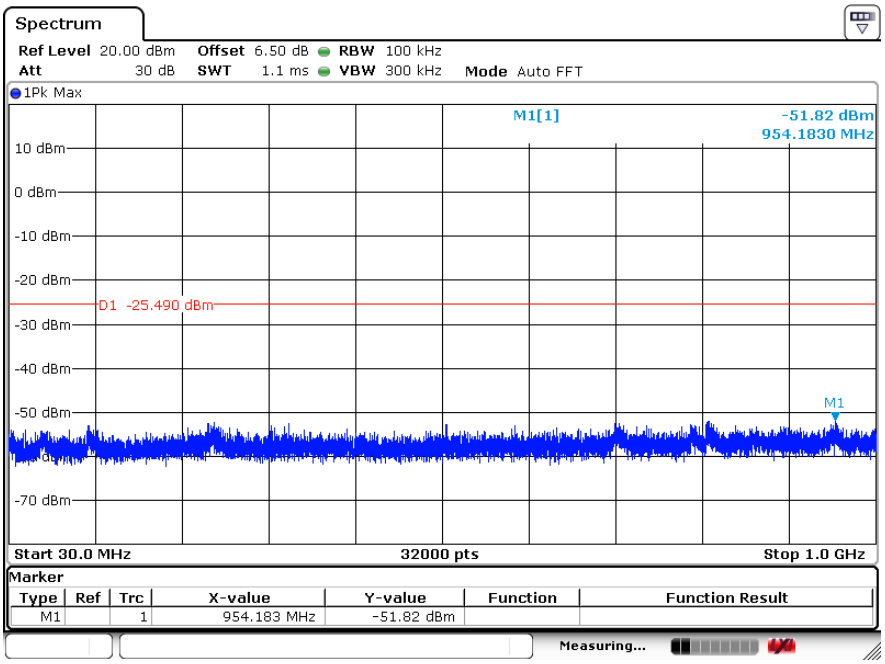



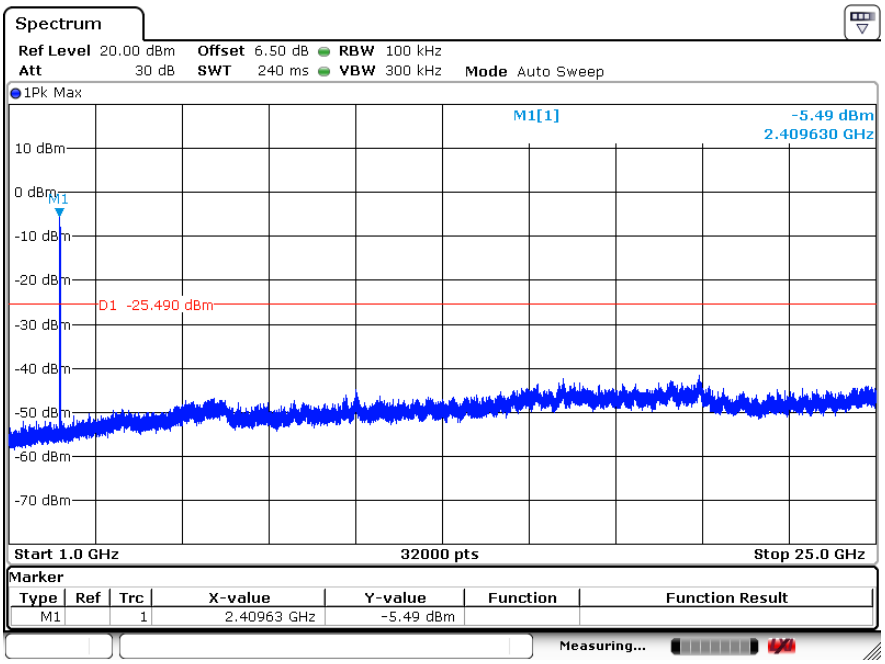
802.11 G Mode CH11



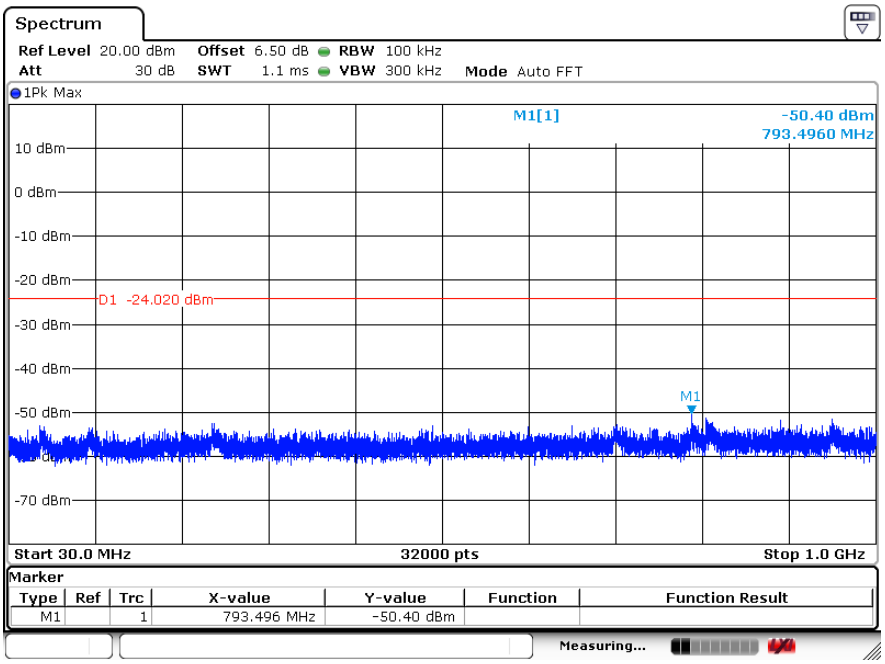



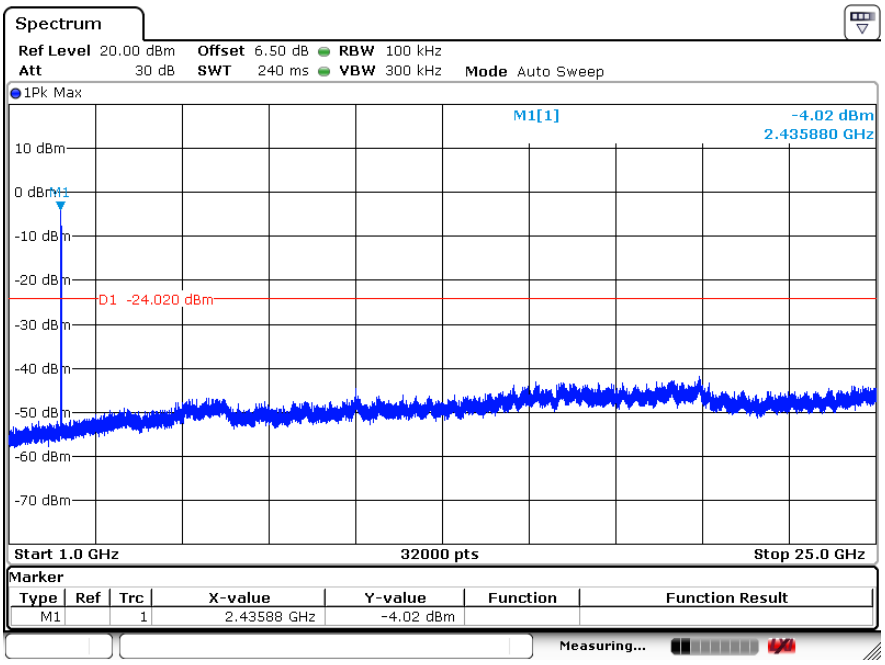
802.11 N20 Mode CH1



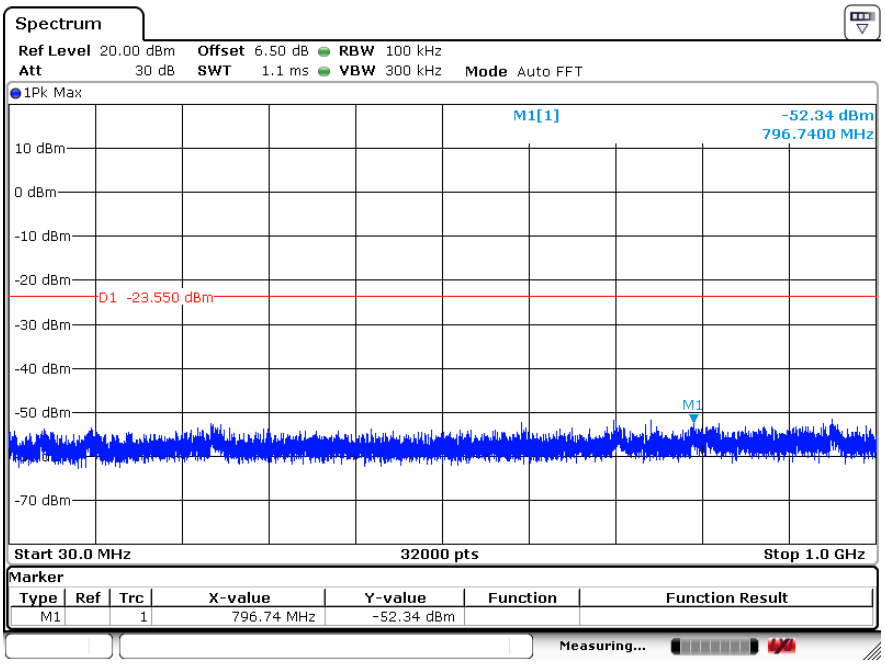



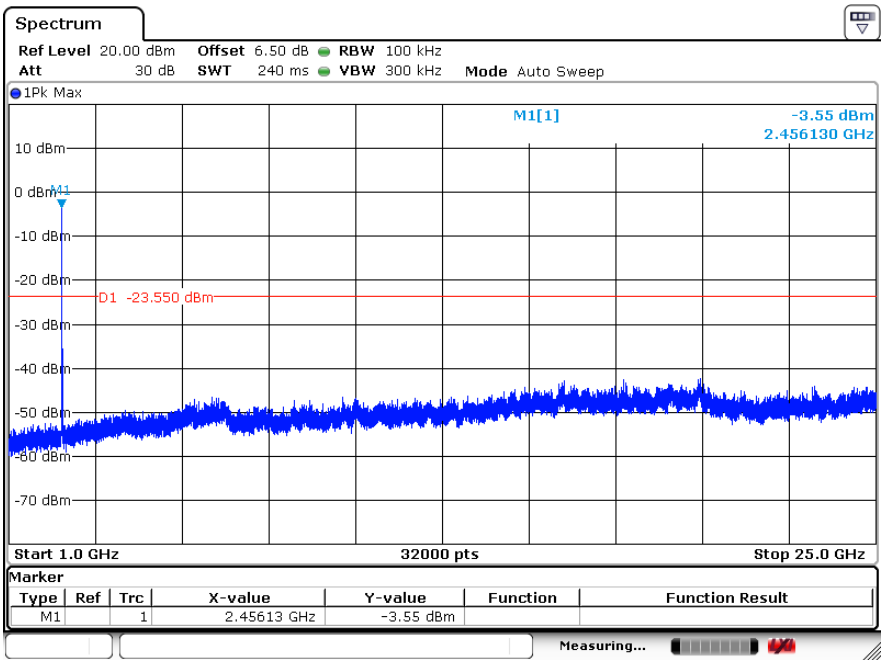
802.11 N20 Mode CH6



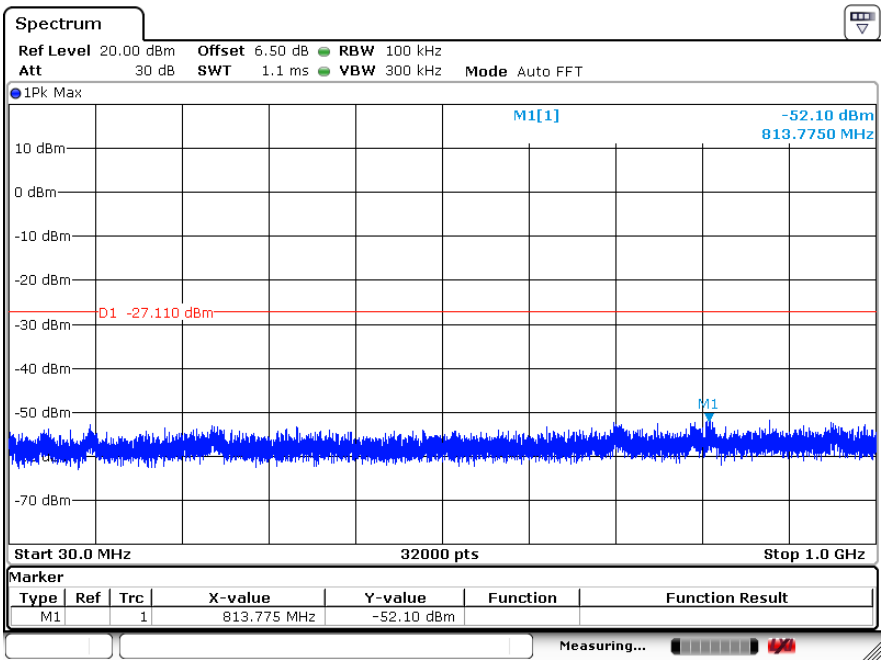



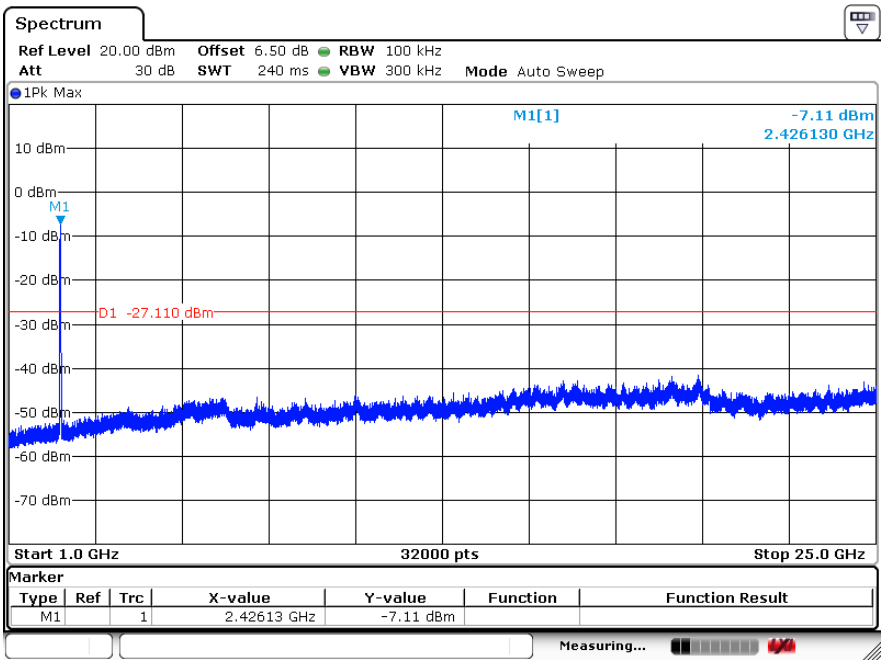
802.11 N20 Mode CH11



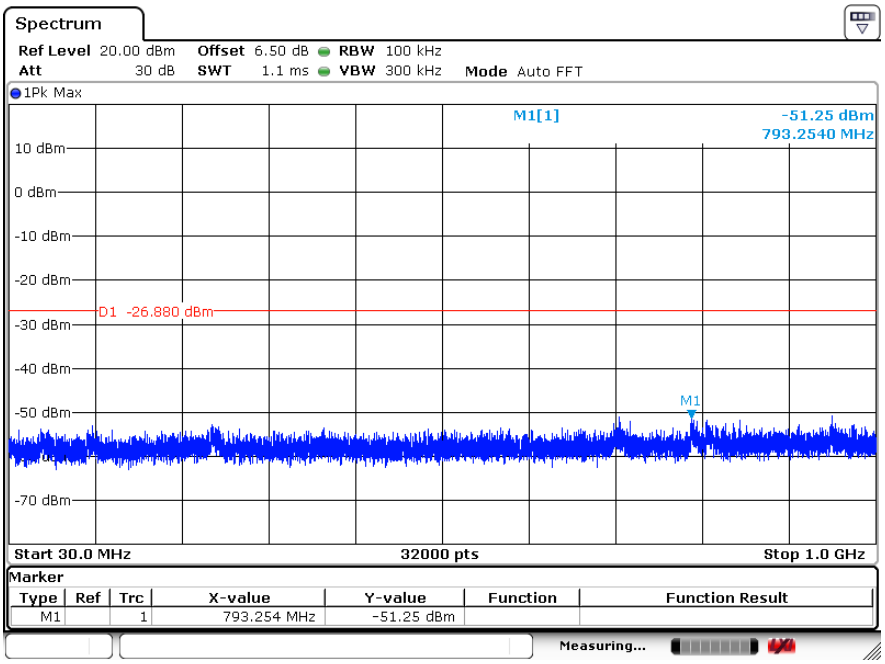



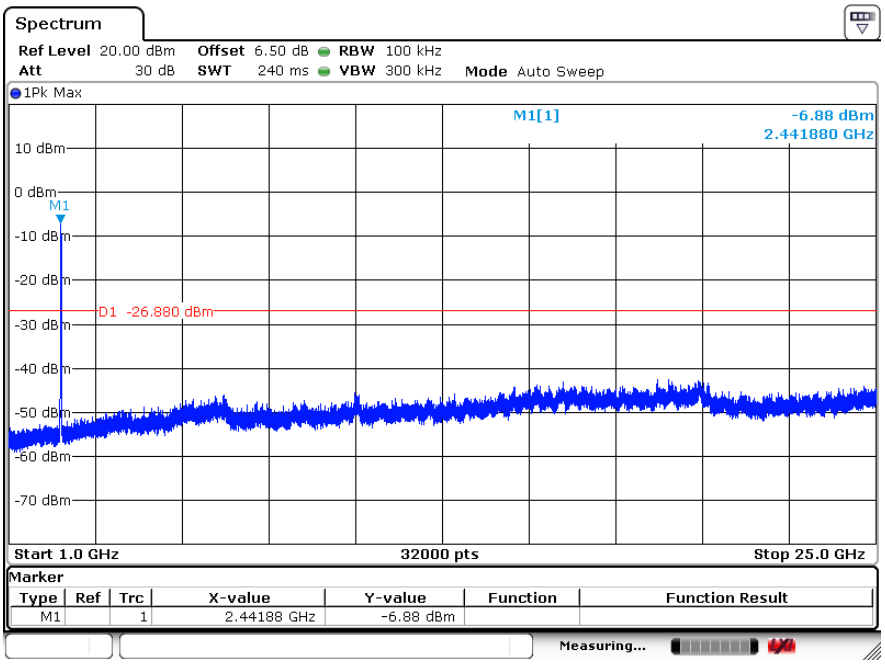
802.11 N40 Mode CH3



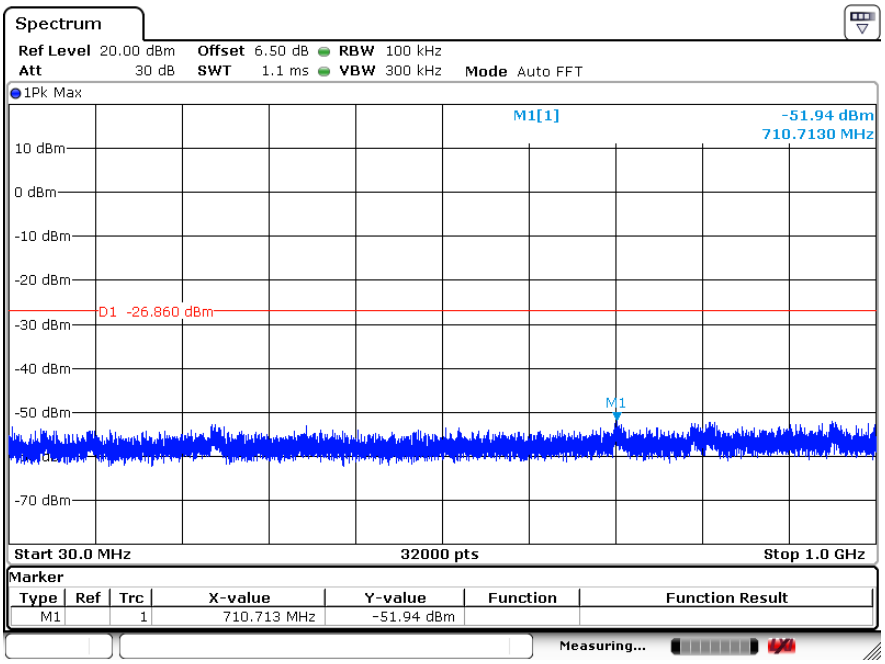



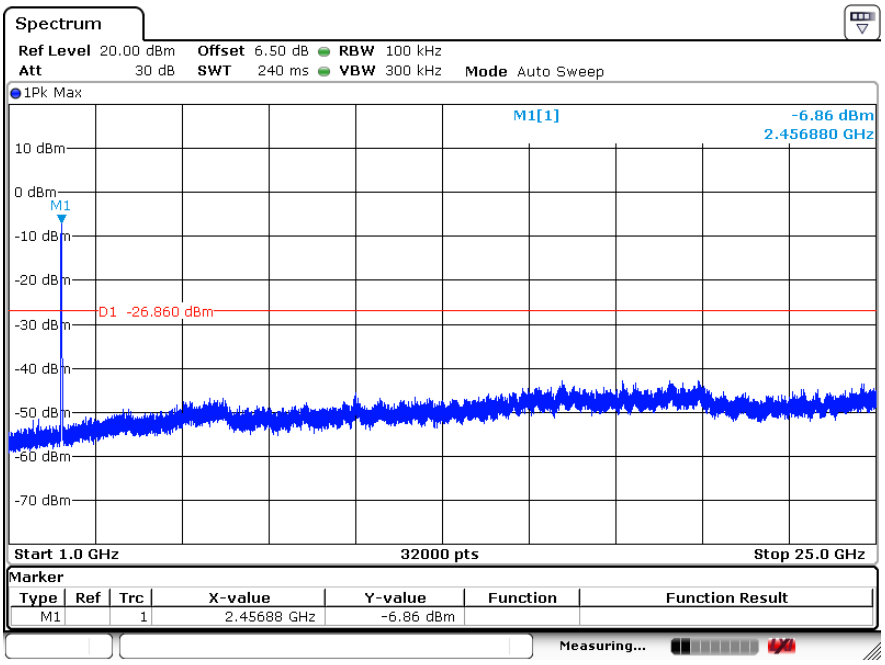
802.11 N40 Mode CH6



802.11 N40 Mode CH9



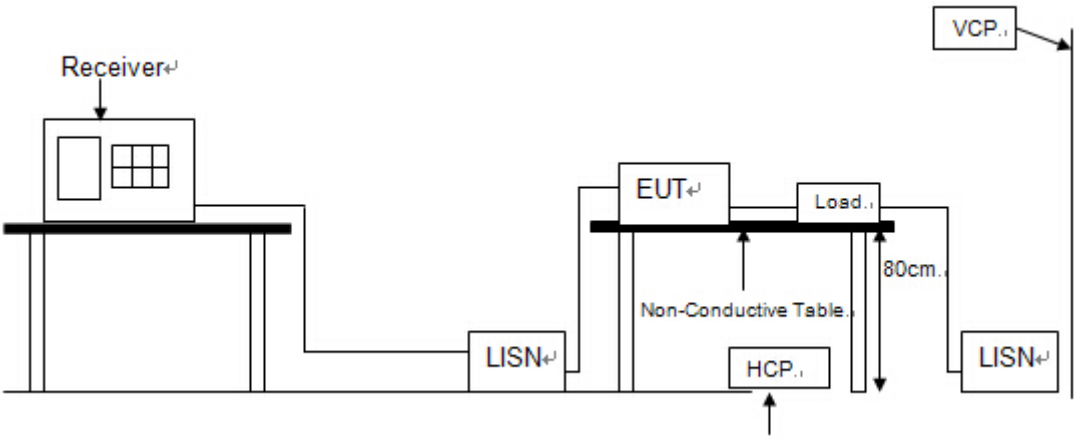



# 9 Power Line Conducted Emission

## 9.1 Test equipment

| Item | Kind of Equipment | Manufacturer | Type No. | Serial No. | Calibrated until |
|---|---|---|---|---|---|
| 1 | Pulse Limiter | MTS-systemtechnik | MTS-IMP-136 | 261115-010-0024 | 12/17/2019 |
| 2 | EMI Test Receiver | R&S | ESCI | 101308 | 12/17/2019 |
| 3 | LISN | AFJ | LS16 | 16011103219 | 12/17/2019 |
| 4 | LISN | Schwarzbeck | NSLK 8127 | 8127-432 | 12/17/2019 |
| 5 | Measurement Software | Farad | EZ-EMC (Ver.ATT-03A) | N/A | N/A |
| 6 | MeasurementSoftware | Farad | EZ-EMC (Ver.ATT-03A) | N/A | N/A |

## 9.2 Block diagram of test setup




## 9.3 Power Line Conducted Emission Limits(Class B)

| Frequency | Quasi-Peak Level dB(μV) | Average Level dB(μV) |
|---|---|---|
| 150kHz ~ 500kHz | 66 ~ 56* | 56 ~ 46* |
| 500kHz ~ 5MHz | 56 | 46 |
| 5MHz ~ 30MHz | 60 | 50 |

Note 1: * Decreasing linearly with logarithm of frequency.

Note 2: The lower limit shall apply at the transition frequencies.

## 9.4 Test Procedure

The EUT and Support equipment, if needed, were put placed on a non-metallic table, 80cm above the ground plane.

Configuration EUT to simulate typical usage as described in clause 2.4 and test equipment as described in clause 10.2 of this report.

All I/O cables were positioned to simulate typical actual usage as per ANSI C63.4.

All support equipment power received from a second LISN.

Emissions were measured on each current carrying line of the EUT using an EMI Test Receiver connected to the LISN powering the EUT.

The Receiver scanned from 150 kHz to 30MHz for emissions in each of the test modes.

During the above scans, the emissions were maximized by cable manipulation.

The test mode(s) described in clause 2.4 were scanned during the preliminary test.

After the preliminary scan, we found the test mode producing the highest emission level.

The EUT configuration and worse cable configuration of the above highest emission levels were recorded for reference of the final test.

EUT and support equipment were set up on the test bench as per the configuration with highest emission level in the preliminary test.

A scan was taken on both power lines, Neutral and Line, recording at least the six highest emissions.

Emission frequency and amplitude were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit.

The test data of the worst-case condition(s) was recorded.

The bandwidth of test receiver is set at 9 KHz.

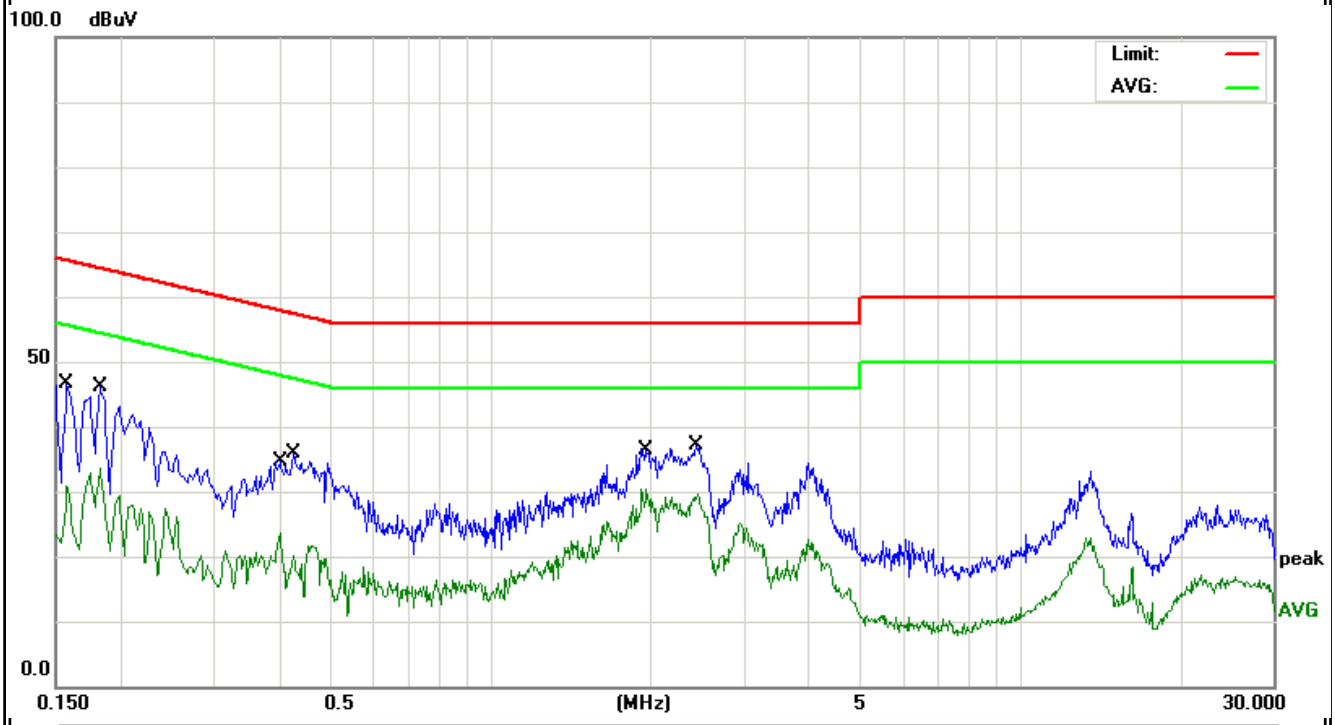
## 9.5 Test Result

PASS. (See below detailed test result)

Note1: All emissions not reported below are too low against the prescribed limits.

Note2: **"-----"** means peak detection; **"-----"** mans average detection

| EUT: | Service-Ready Access Point | Model No.: | RA345 |
|---|---|---|---|
| Temperature: | 23℃ | Relative Humidity: | 52% |
| | | Test Power: | AC 120V/60Hz |
| Probe: | N | Test Result: | Pass |
| Test Time: | 2019-05-20 | Test By: | |
| Standard: | (CE)FCC PART 15 class B_QP | | |
| Test Mode: | TX | | |
| Note: | | | |

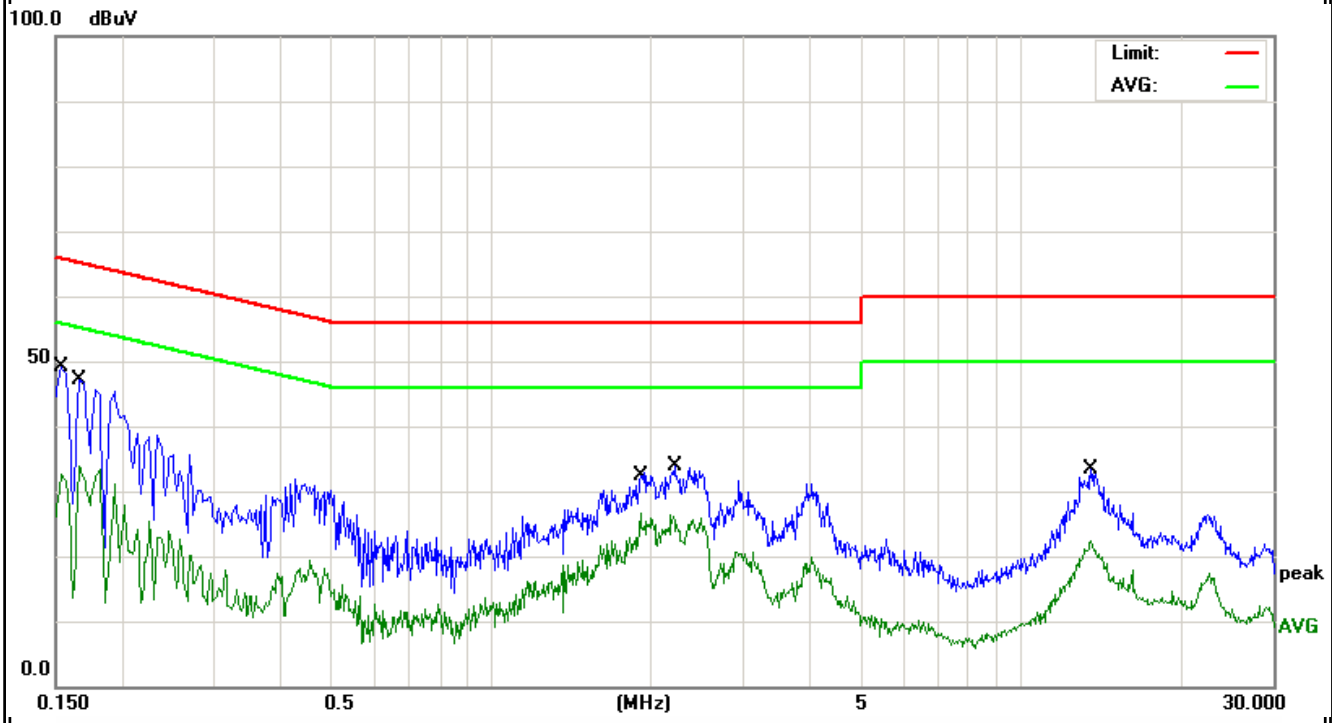



| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV | dBuV | dB | Detector |
| 1 | | 0.1580 | 34.76 | 11.75 | 46.51 | 65.56 | -19.05 | QP |
| 2 | | 0.1819 | 22.22 | 11.36 | 33.58 | 54.39 | -20.81 | AVG |
| 3 | | 0.3980 | 13.44 | 10.13 | 23.57 | 47.89 | -24.32 | AVG |
| 4 | | 0.4220 | 25.83 | 10.11 | 35.94 | 57.41 | -21.47 | QP |
| 5 | * | 1.9660 | 20.29 | 9.99 | 30.28 | 46.00 | -15.72 | AVG |
| 6 | | 2.4420 | 27.04 | 10.01 | 37.05 | 56.00 | -18.95 | QP |

The test result is calculated as the following:

(1) Result = Reading + Correct Factor
(2) Correct Factor = (LISN, ISN, PLC or Current Probe) Factor + Cable Loss +Attenuator
(3) Margin = Result - Limit

| EUT: | Service-Ready Access Point | Model No.: | RA345 |
|---|---|---|---|
| Temperature: | 23℃ | Relative Humidity: | 52% |
| | | Test Power: | AC 120V/60Hz |
| Probe: | L1 | Test Result: | Pass |
| Test Time: | 2019-05-20 | Test By: | |
| Standard: | (CE)FCC PART 15 class B_QP | | |
| Test Mode: | TX | | |
| Note: | | | |




| No. | Mk. | Freq. | Reading Level | Correct Factor | Measure-ment | Limit | Over | |
|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV | dB | dBuV | dBuV | dB | Detector |
| 1 | * | 0.1539 | 37.40 | 11.84 | 49.24 | 65.78 | -16.54 | QP |
| 2 | | 0.1660 | 22.38 | 11.61 | 33.99 | 55.15 | -21.16 | AVG |
| 3 | | 1.9140 | 16.59 | 9.99 | 26.58 | 46.00 | -19.42 | AVG |
| 4 | | 2.2220 | 23.77 | 10.00 | 33.77 | 56.00 | -22.23 | QP |
| 5 | | 13.6220 | 22.91 | 10.38 | 33.29 | 60.00 | -26.71 | QP |
| 6 | | 13.6220 | 11.99 | 10.38 | 22.37 | 50.00 | -27.63 | AVG |

The test result is calculated as the following:

(1) Result = Reading + Correct Factor
(2) Correct Factor = (LISN, ISN, PLC or Current Probe) Factor + Cable Loss +Attenuator
(3) Margin = Result - Limit

# 10. Antenna Requirements

## 10.1. Limit

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

## 10.2. Result

The antennas used for this product are built-in undetachable dipole antenna and that no antenna other than that furnished by the responsible party shall be used with the device, the maximum peak gain of the transmit antenna is only 1 dBi. The EUT has an internal antenna, the directional gain of antenna is 1 dBi, and the antenna connector is designed with permanent attachment and no consideration of replacement. Therefore the EUT is considered sufficient to comply with the provision.